BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

Vol. 58 1961 No. 12

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

WEST AFRICAN COUNCIL FOR MED. RES. **Infectious Diseases of the Pre-School Child.** Proceedings of a Conference held at Lagos, Nigeria, January 25th to January 27th, 1961. Session No. 7, **Malaria. [i] The Natural History of "Stable"** *falciparum* **Malaria in the Pre-School Child** [GILLES, H. M.]. *West African Med. J.* 1961, Aug., v. 10, No. 4, 293–8, 4 figs. [19 refs.] **[ii] The Effects of Malaria Control on Growth and some Other Health Indices** [DRAPER, C. C.]. *Ibid.*, 298–302, 4 figs. **[iii] Growth and Mortality in Children in an African Village** [MCGREGOR, I. A., BILLEWICZ, W. Z. & THOMSON, A. M.]. *Ibid.*, 303–4. **[iv] The Effect of Malaria on the Serum Gamma Globulin Concentration in Africans** [EDOZIEN, J. C.]. *Ibid.*, 304–10, 6 figs. Discussion 310–13.

i. It is known that the serum pattern of Africans contains more gamma globulin than that of Europeans. In an attempt to determine what part, if any, malaria plays in this and whether a rise in gamma globulin can be related to the development of clinical immunity, two groups of African children living in a holoendemic district of the Gambia, one of which was protected by continuous chemoprophylaxis while the other received antimalarial therapy only when this was called for by clinical illness, were observed over a period of 5 years.

By the 24th month of life, the unprotected children were found to possess significantly higher concentrations of serum gamma globulin than those who were protected. Further observations carried on till the end of the 5-year period showed that the gamma fraction remained significantly higher in members of the unprotected group. No significant differences were noted in albumin values, nutritional status or parasitic infections other than malaria.

If children who have been prevented from contracting malaria during the first years of life discontinue prophylaxis, they develop not only malaria but also a serum gamma globulin fraction of adult proportions.

[See also this *Bulletin*, 1960, v. 57, 940.]

ii. From 1954 to 1959 an experiment was carried out in the Pare-Taveta area of Tanganyika and Kenya with the object of assessing the effects on the population of controlling hyperendemic malaria.

Malaria control has not been associated with any significant changes in rates of growth, and anthropometric observations made every 6 months throughout the period of the scheme failed to elicit any further evidence of the effects of such control. There was however a significant effect on the mean haemoglobin levels of all age-groups, most apparent in infants and the younger children. There was also a significant rise in the mean total white blood cell counts for the younger age-groups. Studies on serum proteins showed a decrease in the amount of gamma globulin in the blood of non-malarious infants as compared with an infected group. There was also a fall in the frequency of enlargement of the liver coincident with, but not as great as, the fall in splenomegaly.

The birth rate rose from between 30 and 40 to almost 50; the crude death rate fell from between 20 and 30 to almost 20; the infant mortality rate from over 200 to about 100; the fertility ratio increased from about 400 to over 500.

These figures suggest that effective malaria control may exert a beneficial effect on child morbidity and mortality.

[See also this *Bulletin*, 1960, v. 57, 1243.]

iii. 187 children born in a Gambian village during the period 1949-53 were observed until the age of 7 years or until death supervened. 43% died before the age of 7 years; the neonatal mortality was 54 and infant mortality 134 per 1,000 births. Mortality remained high for the first 4 years of life, fell abruptly in the 5th year and remained low thereafter.

Contrast of curves of heights and weights of survivors and non-survivors suggested that death occurred swiftly, and not as the terminal event of a long and debilitating process.

Primary malnutrition is not considered to be an important cause of high mortality rates and defective growth in Gambian children. The kwashiorkor syndrome is rare in the area and the breast-fed child is not weaned on to a solitary staple of poor nutritive value such as sweet potato, plantain or cassava, but receives paps of rice, millet or sorghum reinforced by groundnut soups and sauces.

Attention is directed to the important effects of infection. Protozoal, helminthic, bacterial and viral diseases abound, and the growing child is likely to experience frequent and heavy infection at an early age. The period between loss of passive immunity inherited from the mother and the acquisition of active immunity is considered to represent the time of maximum hazard to survival.

iv. The author discusses various theories which have been put forward to account for the high mean concentration of gamma globulin found in African populations, such as liver disease, nutrition, race and immunological response to endemic infection.

Protein malnutrition does not appear to be an important factor but it seems that serum gamma globulin concentration is subject to changes in socio-economic conditions and to environmental factors. Thus, among the rural populations of Nigeria the mean gamma globulin concentration is higher on the coast and decreases as one proceeds northwards.

Observations on two groups of children living in Ibadan, one protected by chemoprophylaxis against malaria, the other not so protected, have confirmed those reported from the Gambia, indicating that malaria is a most important factor in inducing hypergammaglobulinaemia in Africans. The sickle haemoglobin gene appears to augment the hypergammaglobulinaemia in children unprotected from malaria.

The question as to whether the concentration of gamma globulin in the serum of the newborn is a genetically determined value or whether it is dependent on the level in the mother requires further study. It is not sufficient only to investigate Africans who have never been exposed to the necessary environmental stimuli; it is more important to observe the response of European children to the same environmental factors which produce the pattern characteristic of the African in his usual environment. *G. Covell*

CHOUMARA, R. Notes sur le paludisme au Somaliland. **[Observations on Malaria in Somaliland]** *Riv. di Malariologia.* 1961, June, v. 40, Nos. 1/3, 9–34, 3 figs. on pl. & 1 map.

An account is given of the geographical, climatological, ethnological and sociological features of the territory known until 1960 as British Somaliland, which has since been fused with the former Italian Somalia to form an independent State.

The epidemiological picture presented is one of unstable malaria without premunition, the disease being hypoendemic throughout most of the country, with hyperendemic foci in certain areas. *Anopheles gambiae* is the sole important mosquito vector, and the species of malaria parasite encountered is almost exclusively *Plasmodium falciparum*, which from time to time gives rise to epidemics of great severity.

The social and economic conditions of the inhabitants are outlined as well as their degree of education and the organization of the health services. The malarial problems of the country have formed the subject of a special study by a commission of the World Health Organization.

The most serious problem confronting the antimalarial programme is that of nomadism, which is enforced on the population by the scarcity of wells and grazing areas. Under such circumstances malaria control is extremely difficult, and since the population never acquires any real immunity, the stage is set for the occurrence of violent epidemics whenever climatic conditions become specially favourable for the breeding and longevity of the vector mosquito.

Despite these difficulties the author believes that malaria eradication is possible, but not by the spraying of dwellings with residual insecticides alone. Larval control is also necessary and this should be supplemented by an improved system of health education and by zooprophylaxis. Mass drug prophylaxis by conventional methods appears to be quite impracticable, but consideration might be given to their administration by means of medicated salt.

It is essential for the success of the campaign that the whole African Horn (the Somalias and Ethiopia) should be regarded as a single area, to be protected by standardized methods. *G. Covell*

DULAC, P. Considérations sur les paludéens admis à l'hôpital principal de Tananarive. [**Malaria Patients in the Principal Hospital of Tananarive**] *Arch. Inst. Pasteur de Madagascar.* 1961, v. 29, 65–9, 1 graph.

A comparison of the figures relating to admissions for malaria, deaths from malaria and blood films found positive for malaria parasites during the two periods 1947–1950 and 1957–1960 at the Principal Hospital of Tananarive indicates that after the adoption of systematic prophylactic measures in Madagascar in 1949 there was a marked fall in malarial incidence, the figures representing morbidity and mortality in 1950 being less than half those for 1949.

The figures for 1951 to 1956 are not given, but presumably they continued to fall, for in 1957 there were only 20 admissions for malaria as compared with 723 in 1950. Thereafter the figures again increased and in 1960 there were 134 admissions attributed to malaria.

A critical analysis of these 134 cases has convinced the author that the figures recorded do not represent the true incidence of malaria, the number of proved cases being only 39. No case of malaria was encountered in subjects who had never left Tananarive, and it is concluded that urban transmission of the disease is non-existent. Under the circumstances, it would seem possible to dispense with mass drug prophylaxis and insecticidal spraying in the town of Tananarive, relying instead on certain other precautions, of which the principal are (1) more careful and more frequent drug prophylaxis for children returning from holidays; (2) propaganda directed towards individual drug prophylaxis for those travelling from Tamatave to Tananarive by road, rail or air; (3) obligatory notification of all cases of malaria confirmed by laboratory examination. *G. Covell*

MORCOS, W. M. Observations morphologiques des divers stades de *Plasmodium vivax* et de *Plasmodium malariae* dans le sang conservé à froid pour transfusion. [**Morphological Observations on Different Stages of** *Plasmodium vivax* **and** *P. malariae* **in Blood kept in the Cold for Transfusion**] *Riv. di Malariologia.* 1961, June, v. 40, Nos. 1/3, 41–50. [10 refs.]

The danger of transmitting malaria by transfusion has been recognized since 1911, even with blood kept for some days at low temperature. Recently blood containing *P. malariae* was found to be still infective when kept for 11 days at 4–6°C., and also blood with *P. vivax* kept for 5–6 days under the same conditions [this *Bulletin,* 1961, v. 58, 887]. Nowadays, infectivity can be maintained as a matter of routine over long periods at –70°C.

There have been only rare observations on the morphological behaviour of the different stages of malaria parasites when kept at these low temperatures. The author has investigated these changes and the longevity of parasites under such conditions. Suitable blood was kept with anticoagulant and preservative in sterile ampoules at 0–4°C. Stained samples were then studied at intervals. After 24 hours under these conditions a fall in numbers of parasites was apparent, and the rate of disappearance increased with time. The maximum period of persistence of the different stages of normal parasites of *P. vivax* and *P. malariae* was 12 days. The behaviour of each stage is discussed in turn, but the factors which lead to parasite removal were not determined.

Ring stages survived best and schizonts kept their morphological characters better than trophozoites and gametocytes. There was no correlation between viability of parasites and the number initially present. It is suggested that all blood suspected of harbouring malaria parasites should be kept for at least 12 days near zero temperature before transfusion. *J. D. Fulton*

SMITH, A. **Resting Habits of *Anopheles gambiae* and *Anopheles pharoensis* in Salt Bush and in Crevices in the Ground.** [Correspondence.] *Nature*. 1961, June 24, v. 190, 1220–21.

Anopheles gambiae and *A. pharoensis* feeding on cattle tethered outdoors by night in the Pare-Taveta area of East Africa—at the village of Bumba—rested in large measure in, respectively, dense salt-bush or sparse, more open salt-bushes and grass in the rains (November–May), but concentrated in deep soil crevices in the dry season (June–October). The results for these crevices resembled previous peak catches in the dry season in artificial box shelters in the village, the boxes offering in the dry season more congenial shelters than most available natural sites. These findings were part of studies to elucidate reasons for failure to eradicate *A. gambiae* by indoor residual sprayings in tropical Africa. *D. S. Bertram*

ARMSTRONG, J. A. & BRANSBY-WILLIAMS, W. R. **The Maintenance of a Colony of *Anopheles gambiae*, with Observations on the Effects of Changes in Temperature.** *Bull. World Health Organization*. Geneva. 1961, v. 24, Nos. 4/5, 427–35, 4 figs.

A colony of *Anopheles gambiae* was started by the Colonial Pesticides Research Unit at Arusha, Tanganyika, from a laboratory strain kept several years at the East African Institute of Malaria at Amani, Tanganyika [this *Bulletin*, 1956, v. 53, 969]. Details are given of rearing methods tried and adapted at the Arusha laboratory, so that large numbers could be obtained for insecticide testing.

The original strain was fed on human blood, but this was impracticable in Arusha. Guineapigs were unattractive. About 10% of adults fed at first on rabbits, the proportion increasing over several years to 60%. Adults emerged into cages measuring 1 cubic foot and remained there for 7 days; they were then transferred to a larger cage (maximal fertilization had occurred by the 7th day in the smaller cage). Bloodmeals, on the rabbit, were offered on alternate days, good feeding occurring from the third day onwards. The gonotrophic cycle, at 26.5°C.—the optimal temperature of several (22°–29°C.) tested at different phases of the life cycle—lasted 2 days. At this temperature, development from egg to pupa took about 9 days, and a complete cycle from egg through to a further oviposition lasted 15 days.

Eggs, laid on damp filter paper, were kept 48 hours on damp wool and then immersed for hatching. Larvae were reared in enamel pans in rather less than an inch depth of water (boiled stream water) and fed by dusting with dried meat-bone powder. A few large larvae helped to keep scum down. Sods of earth, or an earth substrate, were discarded as unnecessary and awkward.

Insectary conditions were routinely kept at about 26·5°C. and 70–90% relative humidity, and average daily mortalities were 1·5% (females) and 1·8% (males). Larval mortalities were 5%. A cage of 400 females and 400 males produced about 4,000 eggs daily, and enough cages were kept to give a daily supply of 130,000 eggs. *D. S. Bertram*

HAMON, J., CHAUVET, G. & THÉLIN, L. Observations sur les méthodes d'évaluation de l'âge physiologique des femelles d'anophèles. **[Observations on the Methods of Evaluation of Physiological Age of Female Anophelines]** *Bull. World Health Organization*. Geneva. 1961, v. 24, Nos. 4/5, 437–43. [10 refs.]

The efficiency of different methods of classifying mosquitoes as parous or nulliparous was studied in the vicinity of Bobo Dioulasso, in the Republic of the Upper Volta, West Africa. The observations were made on *Anopheles gambiae, A. funestus, A. nili, A. coustani, A. flavicosta* and *A. pharoensis*.

Age-assessment by counting dilatations [follicular relics] in ovarioles was not practicable, and qualitative changes in the ampullae and oviducts were found to be unreliable. Detection by dissection of a trace of an old follicle and the absence of close coils or leashes of tracheoles in the dried ovaries of parous females, proved to give comparable results in critical comparative dissections, but by the latter method four times as many specimens could be assessed (50 to 60 per hour). This tracheal method was, however, applicable usually only to ovaries less than late stage 2 and the first method was necessary for later stages up to stage 3. No method was possible in stage 4 or 5 ovaries.

Despite these practical limitations the following observations were possible and are discussed with tabular data as a first statement of biological problems which these techniques reveal and which are at present under further study.

Night catches on bait and morning catches in artificial shelters give similar percentages of parous females in the case of *A. flavicosta* but, for *A. funestus*, these samples give different values, the females from the shelters being more predominantly nulliparous. *A. funestus*, therefore, presents difficulties in terms of satisfactory representative sampling. Other data, based on the state of parity, show that many *A. gambiae* and *A. funestus* refeed on the same night as they have laid eggs, but *A. nili* and *A. coustani* do not refeed on this night. Also, eggs are not necessarily laid when mature but are retained by some females for 24 or 48 hours before being oviposited. Thus, the interval between two ovipositions is appreciably longer on the average than the true time required for a gonotrophic cycle. Although it is not statistically certain, more parous than nulliparous females were apparently feeding in the later part of the night than earlier (*A. funestus, A. nili, A. coustani*).

Finally, proportions of nulliparous and parous females coming to bite bait at night were compared for *A. gambiae, A. funestus, A. nili, A. coustani, A. flavicosta* and *A. pharoensis* in a village treated with DDT and in an untreated village. For *A. gambiae, A. funestus* and *A. nili* fewer older (parous) mosquitoes were taken in the treated village (12 to 30% fewer) than in the unsprayed area. Similar findings for *A. coustani*, but lack of any appreciable difference for *A. flavicosta* and *A. pharoensis* may not be real and due rather to small numbers available for dissection.

Again, *A. funestus* is peculiar in that parous females are always relatively more numerous than for *A. gambiae*. In the light of this and other facts, it is thought that the lower sporozoite rates of *A. funestus* may be due to its relatively smaller blood meal. *D. S. Bertram*

MARMONT, A. La dimostrazione del parassita malarico nel sangue per mezzo della microscopia in fluorescenza e di un fluorocromo, l'arancio di acridina (AO). **[Demonstration of Malaria Parasites in the Blood by Means of Fluorescence Microscopy and Staining with Acridine Orange]** *Giorn. di Malattie Infettive e Parassit.* 1960, Sept.–Oct., v. 12, Nos. 9/10, 732–3, 2 coloured figs. [12 refs.]

Two patients naturally infected with malaria (*Plasmodium vivax* and *P. falciparum*) and a series of patients suffering from Buerger's disease and receiving malaria therapy (with a Roman strain of *P. vivax*) were studied by means of fluorescence microscopy of the blood, 0·4% acridine orange in absolute alcohol being used as the stain.

The cytoplasm of the ring form appears red, and the nucleus greenish yellow; a similar colour contrast is presented by the schizont and gametocytes of *P. vivax*. The characteristic colour of fluorescence denotes the presence of RNA in the cytoplasm and DNA in the nucleus. Parasites can be recognized and identified immediately by this method. Two coloured plates illustrate the paper. *P. C. C. Garnham*

JELLIFFE, E. F. P. & JELLIFFE, D. B. **Minimal Single-Dose Subcutaneous Chloroquine Therapy of Malaria in Partly Immune African Pre-School Children.** *J. Trop. Med. & Hyg.* 1961, Aug., v. 64, No. 8, 191.

In recent years it has become recognized that poliomyelitis is endemic in the country surrounding Kampala, Uganda. With the object of reducing the risk of "fixation" poliomyelitis, efforts have been made to minimize the number of intramuscular injections given to children attending Mulago Hospital. As part of this endeavour, single-dose treatment by subcutaneous injection of standard chloroquine solution (40 mgm. of base per ml.) has been introduced for young children clinically ill with malaria. The dose given is 5 mgm. of chloroquine base per kgm. body weight.

Blood smears were examined from 25 children, aged 6 months to 5 years, with *Plasmadium falciparum* infections, at approximately 12-hour intervals after the injection had been given, until the blood became negative. In all subjects pyrexia had subsided by the second day and clearance of parasites had occurred within 36 to 48 hours.

It is concluded that chloroquine given subcutaneously has the same type of range of activity as when given intramuscularly [this *Bulletin*, 1953, v. 50, 792]. For those with grave manifestations, however, the intramuscular route may be required.

[See also CLYDE, *ibid.*, 1961, v. 58, 1214.] *G. Covell*

TARLOV, A. R.; KELLERMEYER, R. W.; BREWER, G. J.; SCHRIER, S. L.; CARSON, P. E.; ALVING, A. S. **The Hemolytic Effect of Primaquine. XI. Decreased Catalase Activity in Primaquine-Sensitive Erythrocytes** [TARLOV & KELLERMEYER]. *J. Lab. & Clin. Med.* 1961, Aug., v. 58, No. 2, 204–16, 2 figs. [32 refs.] **XII. Shortened Erythrocyte Life Span in Primaquine-Sensitive Male Negroes in the Absence of Drug Administration** [BREWER, TARLOV & KELLERMEYER]. *Ibid.*, 217–24, 2 figs. [36 refs.] **XIII. Gradient Susceptibility to Hemolysis of Primaquine-Sensitive Erythrocytes** [KELLERMEYER, TARLOV, SCHRIER, CARSON & ALVING]. *Ibid.*, 225–33, 5 figs. [25 refs.]

The United States Army Medical Research Unit, Chicago, have continued their researches on the haemolytic effect of primaquine [this *Bulletin*, 1954, v. 51, 676; 1955, v. 52, 8, 333, 334, 509, 510, 610; 1958, v. 55, 730, (1201); 1959, v. 56, (1216)].

It is known that erythrocytes of certain people haemolyse *in vivo* after the administration of primaquine and other compounds, and that among those susceptible to haemolysis are 10–15% of American Negroes and many other darkly pigmented people. The term primaquine-sensitive is applied to erythrocytes of persons who undergo an acute *in vivo* haemolysis when a standard course of 30 mgm. of primaquine is given daily for 14 days.

The subjects of the investigation were Negro volunteers, either male inmates of the Illinois State Penitentiary, Joliet, or female inmates of the State Reformatory, Illinois, none of whom had received haemolytic drugs for at least 4 months previously.

Various abnormalities in the erythrocytes of primaquine-sensitive subjects already recorded are directly related to, or dependent upon, carbohydrate metabolism. In Part XI of their series the authors report that the erythrocytes of such persons are also deficient in catalase, an enzyme which appears to be only distantly related, or entirely unrelated, to carbohydrate metabolism, the catalase content of the men being only 60% of normal, while some of the women had decreased erythrocyte catalase activity.

The genetic significance of these findings and their relationship to the mechanism of drug-induced anaemia are discussed.

Earlier workers have assumed that the biochemical abnormalities noted in the erythrocytes of primaquine-sensitive subjects are harmless unless drugs are administered.

In Part XII of this series of studies observations are recorded which show that these cells die prematurely *in vivo* even when not exposed to the influence of drugs. These studies indicate that glucose-6-phosphate dehydrogenase, or the pentose pathway of which it is a part, plays an important role in maintaining the red cell through a normal life span.

As already noted, the erythrocytes of American Negroes who are primaquine sensitive undergo haemolysis when a standard dose of 30 mgm. of the drug is given daily over a period of 14 days. In Part XIII of the series it is recorded that if the same drug dosage is continued the acute clinical haemolysis and anaemia disappear.

It is concluded that the susceptibility of primaquine-sensitive erythrocytes to haemolysis is not an all-or-none phenomenon; the cells have a graded susceptibility to haemolysis and become progressively more vulnerable with increasing

age. The haemolytic gradient probably reflects the decrease in activity of glucose-6-phosphate dehydrogenase and possibly other enzymes during senescence of erythrocytes. *G. Covell*

RAFFAELE, G. & CARRESCIA, P. M. Efficacia di dosi uniche di antimalarici di sintesi. Azione della primachina. [**The Efficacy of Single Doses of Synthetic Anti-malaria Drugs—The Action of Primaquine**] *Riv. di Malariologia.* 1961, June, v. 40, Nos. 1/3, 51–9. English summary.

Malaria can nearly always be eradicated by the use of insecticides with a residual action, but it is often desirable to bring about an early break in the cycle of infection by treating carriers with appropriate drugs to sterilize the source of infection for the mosquitoes. Both chloroquine and amodiaquine have been shown experimentally to be very effective for this purpose when given in a single dose of 600 mgm.

The authors here report their results when they investigated the corresponding action of primaquine, given in a single dose of 30 mgm. to GPI patients who were undergoing malaria therapy through the bites of *Anopheles labranchiae atroparvus*. The drug has already been shown to be quite effective against the gametocytes of *Plasmodium falciparum* and, owing to shortage of patients, the further investigation with this species had to be discontinued on this occasion at an early stage. The effect of the drug on the gametocytes of *P. vivax* was studied in 16 patients, each of whom had been shown to have acquired an adequate concentration of gametocytes in his blood; the presence of sporozoites and oöcysts was also confirmed in the mosquitoes in each case.

The action of primaquine proved neither constant nor of long duration: even within 24 hours of having taken the drug, patients were shown to infect mosquitoes to the bite of which they were exposed. A single dose of primaquine cannot, therefore, be relied upon quickly to rid carriers of the gametocytes of *P. vivax* which may be circulating in their blood. *J. Cauchi*

ARDELEAN, I. & CRISTESCU, Aurelia. **Investigations on the Resistance of Anopheles to Residual Insecticides.** *Rumanian Med. Rev.* 1960, Oct.–Dec., v. 4, No. 4, 91–3.

Anopheles labranchiae atroparvus was colonized in two separate colonies in the laboratory in 1949 and, over 54 generations, their maintenance differed only in that one was, in every generation, exposed to sublethal doses of DDT.

This paper does not give all important details, but the following results are reported. Development of resistance took place by the 18th generation in the treated colony and, thereafter, increasing to at least the 50th generation [about x 12]. But it required, apparently, only 4 to 6 generations of freedom from further selection for susceptibility to revert to the level of the control colony. The life cycle from adult to adult differed little between the colonies but the duration of different phases differed, *e.g.* larval periods were a mean of 14·4 days for the treated colony, and 17·6 days for the control one; conversely, the period from emergence to laying was shorter in the controls, and less variable. Pupal life differed little.

No difference was found in the number of oöcysts of malaria parasites [? species of *Plasmodium*, presumptively *vivax*] in the controls compared with the treated colony in its 37th to 42nd generations.

Reference is simply made to change in morphology in the treated colony but without any indication of its actual nature. *D. S. Bertram*

GÖKBERK, C. **The Results of Three Years of Dieldrin Application in a Malarious Area, Adana-Turkey.** *Riv. di Malariologia.* 1961, June, v. 40, Nos. 1/3, 1–8, 2 figs.

A survey made in 1958 in the Yenice area of Adana region, Turkey, showed that *Anopheles sacharovi*, the local malaria vector, had become resistant to DDT. Dieldrin was therefore substituted as spraying agent and was applied over a period of 3 years. As a result, *A. sacharovi* almost disappeared from the treated areas.

Resistance of anopheline mosquitoes to dieldrin has been reported from a number of countries, and various possible reasons why such resistance has hitherto not been encountered in Turkey are discussed. No adequate explanation has so far been arrived at, and the author points out that the problem cannot be properly studied until laboratory colonization of *A. sacharovi* has been successfully achieved. *G. Covell*

DAVIDSON, G. & JACKSON, C. Elizabeth. **Insecticide Resistance in Mosquitoes.** [Correspondence.] *Nature.* 1961, Apr. 22, v. 190, 364–5.

Dieldrin resistance was shown to be in *Anopheles gambiae* from Northern Nigeria dependent on a single, semi-dominant gene and was associated with accompanying resistance to gamma BHC, but not to DDT [this *Bulletin*, 1957, v. 54, 124 *bis*]. This mechanism has now been confirmed for two other West African strains of *A. gambiae*, for *A. albimanus* from El Salvador, *A. quadrimaculatus* from Maryland and Florida, and for *Culex fatigans* in Ceylon.

DDT resistance, as originally demonstrated for *A. sundaicus* from Indonesia, is also monofactorial but recessive, and susceptibility to dieldrin and gamma BHC is not modified. DDT resistance of similar nature was selected for in laboratory *A. albimanus*, and finally proved also for *A. stephensi*.

Of special interest, however, is that it has been possible to select out, in the laboratory, from the original dieldrin-resistant strain of *A. albimanus* from El Salvador, the DDT-resistant strain referred to above, and also a third strain in which the individuals are highly resistant to both dieldrin and DDT, *i.e.* double resistance.

Thus, both these characteristics can co-exist in mosquitoes and this emphasizes the need to search for effective insecticides outside the chlorinated hydrocarbon group of organic chemicals. *C. fatigans*, it was found, was naturally in the adult stage more tolerant to DDT than are anophelines, but the larvae are more susceptible to DDT than those of susceptible anophelines.

D. S. Bertram

AIAPPA, M. T. **A Note on the Residual Foci of Malaria Transmission encountered in the course of Experimental Surveillance Operations in Coorg District of Mysore State.** *Indian J. Malariology.* 1961, Mar., v. 15, No. 1, 1–10, 2 maps.

Coorg, which has an area of 1,600 square miles with a population of some 300,000, was formerly one of the most highly malarious areas in the western hill tracts of India. Malaria control operations were started in 1947 and the district was included in the National Malaria Control Programme in 1953. There followed a spectacular fall in malarial incidence, the spleen rate, which had exceeded 58% in 1947 remaining below 1% during the years 1953, 1954 and 1955. The infant parasite rate dropped from 5·7% in 1951 to zero in 1956.

DDT residual spraying was discontinued in 1957 and a system of surveillance was brought into operation in the same year. During 1958 and 1959, 81 parasite-positive cases (41 *Plasmodium vivax*, 26 *P. falciparum*, 1 *P. malariae*, 13 mixed or undetermined) were detected among tribes inhabiting a forested and thinly populated area in the south-eastern corner of the district. The persistence of transmission is attributed to the fact that DDT coverage in that section of the country had obviously never been complete.

Residual spraying with DDT has now been re-introduced and is to continue for 3 years concurrently with active surveillance. *G. Covell*

PATEL, T. B., RAMACHANDRA RAO, T. & AMBWANI, G. J. **An Outbreak of Malaria in Parts of Thana District, Bombay State, India, after Several Years of Successful Control.** *Indian J. Malariology.* 1961, Mar., v. 15, No. 1, 71–90, 1 map.

An outbreak of malaria, involving over 60% of the inhabitants, occurred in 209 villages over an area of 500 square miles with a population of 86,000 in Thana District, Bombay State, India, in 1958. This area was formerly highly malarious, but had been treated with DDT residual spray from 1948 to 1956, by which time all malariometric indices had fallen to zero or near zero. In 1957 DDT was replaced by dieldrin, but there was no indication of any recrudescence of malaria in that year. In July 1958 however, fresh malaria cases began to appear and a severe epidemic developed, reaching its peak towards the end of September. This was brought under control by the reintroduction of DDT spraying and the distribution of antimalarial drugs. The outbreak was attributed to the failure of dieldrin to control the building up of mosquito densities as the result of resistance in the vector species, *Anopheles culicifacies*.

The outbreak described, occurring in an area formerly hyperendemic but kept almost free from transmission for several years, closely resembled in character the widespread regional epidemics of malaria which used to occur in north-west India at intervals of 5 to 10 years, notably in the rapidity with which it reached its peak. The authors rightly stress the supreme importance of very strict vigilance for the early detection of fresh cases which may occur in the later stages of an eradication programme or after its completion, so that prompt measures may be taken to prevent the development of such epidemics in the future. *G. Covell*

RACHOU, R. G. Problemas relativos a la persistencia de la transmisión de la malaria. [**Problems relating to the Persistence of Transmission of Malaria**] *Bol. Oficina Sanitaria Panamericana.* 1961, July, v. 51, No. 1, 1–25.

The author, who is the Medical Consultant for the Regional Pan-American Health Office of WHO gives an extensive survey of the factors involved in the persistence of malaria in an area. His paper deserves to be read in full but the following are some of the main points.

(1) In view of the successful experiments in transmitting the plasmodia of monkeys to man, monkeys may well be of epidemiological importance, even though the chain monkey–*Anopheles*–man has not been proved in nature.

(2) In any eradication programme spraying must be total, complete, sufficient, and regular, and a number of ways in this connexion in which errors take place are pointed out.

(3) Emphasis is placed on the absorption of insecticides (DDT and dieldrin) by certain surfaces.

(4) The importance of spraying *above* the usually accepted height of 3 metres, and of attics where *Anopheles* can lodge, is pointed out. The early hours of the night are those of major *Anopheles* activity.

(5) Factors relating to the various vectors must be studied in their entirety: *e.g.*, species possibly concerned, susceptibility to infection, resistance to insecticides, habits (anthropophilism, endo- or exophagy), etc. Examples of these are given. Some species rest on the sprayed surfaces for only a short time. *A. albimanus* is mentioned in this instance and the author poses the question as to whether this now represents an adaptation of various *Anopheles* species to a repellent stimulus from the insecticides.

(6) As regards actual resistance to insecticides he points out that species can be resistant to either the DDT or dieldrin group or to both, but that there is no cross resistance. Resistance to dieldrin develops quicker than to DDT, and develops the more rapidly where the actual breeding places are sprayed with the same substance as that with which the houses are treated. In the Americas resistance is due for the most part to the use of insecticides in agriculture and about 10 *Anopheles* species have been proved to have developed it. In Nicaragua the areas of malarial persistence largely coincide with those where *A. albimanus* is resistant to DDT while in El Salvador with the same vector this is not the case.

Thus the author admits that in spite of all possible variations in the behaviour and resistance of the various vectors there remains a number of persistent cases the reason for which it is not easy to determine.

A very full account is given of all the investigations required in any area where malaria is persisting and the author finally concludes that none of the problems is insoluble but that the best solution in one area may not be the best in another. However the golden rules are: not to attempt eradication without full and complete knowledge of *all* the multiplicity of factors involved; not to generalize a solution without some fundamental indication; and once the problem is defined it should be resolved as soon as possible.

W. K. Dunscombe

HECHT, O., MANCERA, Ofelia & ROMÁN Y CARRILLO, G. El efecto de la temperatura sobre las respuestas de algunos mosquitos al contacto con DDT. **[Effect of Temperature on the Response of Some Mosquitoes to Contact with DDT]** *CNEP Bol.* Mexico. 1960, Oct.–Dec., v. 4, No. 4, 222–7, 8 graphs. English summary.

Numerical and graphic data are given showing that the number of flights provoked by contact during 20 minutes of *Anopheles albimanus*, *A. aztecus*, *A. quadrimaculatus* and *Aedes aegypti* with DDT is greatly influenced by temperature. Temperatures tested were at 5° intervals from 15°C. to 35°C., and also at a few lower temperatures where complete inactivity was usual, and at 38·5°C. Mortality from DDT was greatest at higher temperatures. The need to standardize irritability tests is pointed out.

[See also this *Bulletin*, 1961, v. 58, 294, 417.] *D. S. Bertram*

WEBBE, G. **Field Trials of Phosphoric Acid Esters as Larvicides and their Toxicity to Fish.** *Ann. Trop. Med. & Parasit.* 1961, July, v. 55, No. 2, 187–91.

Owing to the toxicity to fish of chlorinated hydrocarbon larvicide preparations, fish ponds often have to be omitted from malaria control operations. The experiments described in this paper from Tanganyika indicate that certain organophosphorus preparations offer a wider margin of safety between the effective larvicidal dose and the toxic dose to fish of the genus *Tilapia*. The preparations used were 2% Baytex granules, 2% methyl parathion granules, 3% chlorthion granules and 3% chlorthion dust.

All 3 compounds were lethal to *Tilapia* fingerlings in 24 hours at 10 p.p.m. concentration and in 48 hours at 5 p.p.m. No mortality occurred in fish subjected to 1 and 0·1 p.p.m. In subsequent field trials complete anopheline and partial culicine larval control was achieved with 0·2 lb. per acre (active substance) of Baytex, and complete culicine larval control with 0·4 lb. per acre. Methyl parathion and chlorthion were equally effective at 0·4 lb. per acre, but did not give complete anopheline larval control at 0·2 lb. per acre. 0·4 lb. per acre equals 0·1 p.p.m. active substance; no fish mortality was observed during the field experiments, and fish growth continued normally. The LD50 for rats of Baytex orally administered is 150–300 mgm. per kgm., of chlorthion 500–2,000 mgm. per kgm. and of methyl parathion $<$ 100 mgm. per kgm. It is considered unlikely that concentrations dangerous to mammals would be produced by proper applications of these formulations under field conditions.

B. B. Waddy

SCHMIDT, L. H., GREENLAND, R., ROSSAN, R. & GENTHER, Clara. **Natural Occurrence of Malaria in Rhesus Monkeys.** *Science.* 1961, Mar. 17, v. 133, 753.

Between 1945 and 1960, 5,600 rhesus monkeys (*Macaca mulatta*) have been examined at the Christ Hospital Institute, Cincinnati, without natural infections of malaria being found among them. Then, in July 1960, an infection was

discovered, to be followed by 22 further examples in 4 batches of monkeys comprising 228 animals, all coming from East Pakistan, probably from near the Burma-Assam border. The parasite appeared to be *Plasmodium inui*; in 2 monkeys a second parasite was also present—probably *P. cynomolgi*. The infections were mild, but were intensified by splenectomy in subinoculated animals.

It is suggested that these natural infections were acquired in the jungles of the eastern border where *M. cynomolgus* and *M. nemestrina* occur. These species are common hosts of malaria parasites elsewhere.

P. C. C. Garnham

SCHNEIDER, J. *P. cynomolgi bastianelli*: hématozoaire du singe transmissible à l'homme. Essai d'impaludation thérapeutique. [**Trials of Malaria Therapy with** *Plasmodium cynomolgi bastianellii*] *Bull. Soc. Path. Exot.* 1961, Jan.–Feb., v. 54, No. 1, 7–11, 1 fig.

Three neurosyphilitic patients were inoculated with *Plasmodium cynomolgi bastianellii* [this *Bulletin*, 1960, v. 57, 1244], the first in the form of sporozoites and the others by infective blood. Mild attacks of fever accompanied by a very low parasitaemia followed, and no paroxysm reached a temperature of higher than 100°F. Nevertheless liver function tests showed temporary abnormalities (lasting up to 3 weeks) in the first patient.

The slight and irregular fever produced by this parasite invalidates its use for malaria therapy. Probably the strain is of slight importance in nature, because it seems to be ill-adapted to the human host, at least to the adult, and disappears spontaneously.

[See also EYLES *et al.*, *ibid.*, 1960, v. 57, 1244.] *P. C. C. Garnham*

COATNEY, G. R. & GREENBERG, J. **Effect of a Diet Deficient in Factor 3, Vitamin E and Cystine on the Course of** *Plasmodium berghei* **Infections in Mice.** *J. Parasitology*. 1961, Aug., v. 47, No. 4, Sect. 1, 601–4, 1 fig. [26 refs.]

Variation in diet of malaria-infected hosts has been claimed to increase (biotin, folic acid, etc.), to decrease (riboflavine, pantothenate, vitamin A, etc.), or to leave unaffected (thiamine, choline, etc.) the degree of parasitaemia. The present authors refer to many investigations on effect of diet and their paper reports results obtained with a diet giving rise to deficiency in Factor 3, vitamin E and cystine on the course of *Plasmodium berghei* infection in mice

For this purpose one group of 50 mice were put on the test diet, which is described in detail, and one group of 50 were put on a normal diet for 4 weeks before inoculation. The course of parasitaemia was followed in stained smears, and data obtained are summarized in a table, without regard to sex of mouse host, and are also represented graphically.

Results indicated that differences were caused by the two diets during the first week but not thereafter. According to the authors the differences could be explained as being due to the effect of the two diets on intensity of infection

in mature red cells. The length of time during which mice were fed on the diets also had little influence on the results. Besides reducing the infection rate in mature erythrocytes the test diet also reduced survival time of the mice. After the first week infection in reticulocytes was preponderant. The major cause of death in the mice was attributed to malaria, rather than to diet.

J. D. Fulton

SERGENT, Ed. & PONCET, Alice. De la température des souris blanches pendant l'accès parasitaire de paludisme à *Plasmodium berghei*. [**Temperature of White Mice during** *Plasmodium berghei* **Parasitaemia**] *Arch. Inst. Pasteur d'Algérie*. 1961, June, v. 39, No. 2, 133–4.

The rectal temperature of 16 healthy young white mice examined over a long period varied between 35° and 39°C. The temperature of 12 such mice inoculated with *Plasmodium berghei* varied little during the first 4 days of parasitaemia, but on the fifth day, it fell sharply to 28°C., the lowest on the scale of the thermometers used for mice, and remained at that level until the mice died 1 to 3 days later.

The authors, therefore, studied the effect of heating the ambient air. Five mice were placed in containers in incubators at 37°C. and 5 were kept in the laboratory at 24°C. The only difference noticed was that 4 of those maintained at 37°C. lost 2 gm. of their original weights (25–27 gm.) in 5 days, while 4 of those at 24°C. gained 2 to 4 gm. during the same period.

The experiment was repeated with 2 groups of 6 mice inoculated with *P. berghei*. Those held at 37°C. died in 4 to 6 days and those at 24°C. died in 6 to 15 days after inoculation.

Evidently *P. berghei* infection caused hypothermia within a few days of infection and heating of the ambient air merely hastened death.

H. J. O'D. Burke-Gaffney

SERGENT, Ed. & PONCET, Alice. De la résistance acquise contre le paludisme des rongeurs à *Plasmodium berghei* par des rats blancs qui ont survécu à une première atteinte. [**Acquired Resistance to Rodent** *Plasmodium berghei* **Infection in White Rats which have survived a Primary Attack**] *Arch. Inst. Pasteur d'Algérie*. 1961, June, v. 39, No. 2, 116–18, 1 graph.

Previous studies [this *Bulletin*, 1956, v. 53, 717] showed that 93% of white rats inoculated with 20 to 40 million *Plamodium berghei* acquired an acute infection, with death in 10%. The survivors developed a lengthy latent infection, lasting for as long as 2 years.

The authors have now re-inoculated 295 of such rats at periods of 1 to 28 months after their primary infections: about the same number of parasites were inoculated. A graph shows that 96·2% of the rats were resistant to re-inoculation: in 60·3% the resistance was complete, in 35·9% there was a "premunition attack" (1 parasite per 100 fields). In the remaining 3·8% there was no resistance and the attack was as severe as the primary infection. These results are tabulated: they correspond closely to previous findings [*ibid*., 1956, v. 53, 1318].

H. J. O'D. Burke-Gaffney

AL-DABAGH, M. A. **Eyelid Lesions in Chicks infected with** *Plasmodium gallinaceum*. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1961, July, v. 55, No. 4, 351–4, 2 figs. on pl. [22 refs.]

Eyelid lesions have been described in chicks during *Plasmodium lophurae* infections as a result of dietary deficiencies [this *Bulletin*, 1950, v. 47, 325]. Similar lesions have now been studied by the present author in the same host infected with *P. gallinaceum* [see also COATNEY, *et al.*, *ibid.*, 1946, v. 43, 629]. He has found that after blood- or sporozoite-induced infection with this parasite eyelid lesions may develop resembling those due to pantothenate deficiency. The condition was characterized by photophobia, lachrymation and inflammatory changes accompanied by necrosis, which may however undergo repair if the host survives. The incidence of lesions was about 17% in blood-induced infections, but only about 1–2% in sporozoite-induced infections of chicks aged 1 to 3 days. The number of red cells infected reached almost 100% in both types of infection in respectively 4–5 and 10 days. The nature of the lesions is described and in some cases they are illustrated by photomicrographs. The possibility that malarial toxins may cause these lesions is considered.

J. D. Fulton

GARNHAM, P. C. C., HEISCH, R. B., MINTER, D. M., PHIPPS, J. D. & IKATA, M. *Culicoides adersi* **Ingram and Macfie, 1923, a Presumed Vector of** *Hepatocystis* (= *Plasmodium*) *kochi* **(Laveran, 1899).** [Correspondence.] *Nature*. 1961, May 20, v. 190, 739–41.

An account is given of work in Kenya which strongly points to *Culicoides adersi* as a vector of *Hepatocystis kochi* in *Cercopithecus aethiops* monkeys frequenting mangrove swamps near Mombasa. Data show that midges fed on infected monkeys had sporozoites in their salivary glands by the 6th to 7th day, where they persisted for at least 17 days although, possibly, declining in numbers from the 13th day onwards. But, in the considerable dissections here reported oöcysts were not found. In a clean vervet monkey bitten by 4 infected midges the prepatent period was 4 months, explicable by the fact that tissue forms of *Hepatocystis* are 40 times larger than liver schizonts in *Plasmodium*, the latter with correspondingly short prepatent intervals of only 5 to 10 days.

D. S. Bertram

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed:— epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

WEST AFRICAN INSTITUTE FOR TRYPANOSOMIASIS RESEARCH. **Annual Report 1960** [WILLETT, K. C., Director]. 61 pp., 4 figs. on 4 pls. 1961. Kaduna, Nigeria.

This report describes the work of the Institute during 1960. The work is much handicapped by shortage of staff.

Among scientific matters it is reported that the semi-domesticated black pig can carry inapparent infections of *Trypanosoma gambiense* and can act as a source of infection for tsetse flies. The *T. congolense-T. dimorphon* group of trypanosomes has been found to comprise strains of various different mean lengths, which cannot be separated into distinct species; the longer trypanosomes tend to be more pathogenic. *T. suis* and *T. simiae* have also been studied. It has been shown with *T. simiae* and *T. congolense* that when a trypanosome divides, one half retains the original flagellum, while a new flagellum gradually grows from the region of the new kinetoplast in the other half.

The blood of some 320 cattle in Benue Province was examined by various means and trypanosomes were found in 19% of thick films, 14% of thin films and 27% of rat inoculations; of these 26% were *T. brucei*, 78–89% were T. *congolense* and 13% *T. vivax* [the figures include mixed infections]. In the serum of cattle and sheep the glutamic pyruvic transaminase and glutamic oxalacetic transaminase are increased; apparently these enzymes originate from the trypanosomes. Pigs can be protected against *T. simiae* by antrycide-suramin complex or antrycide chloride for 175 days; if infected they can also be cured by antrycide-suramin.

Other work has dealt with the resistance of N'Dama calves to infection; antigens of trypanosomes; the use of Berenil in human trypanosomiasis (which has yielded results as good as pentamidine); trials of Mel W; and the identification of the blood meals which have been taken by tsetse flies. The value of the formol gel test for diagnosis of sleeping sickness has been investigated; it was positive in most but not all cases of infection studied. The amino acids present in hydrolysates of trypanosomes have been studied and identified.

The resting places of *G. palpalis* have been found to be leaves or twigs within one foot of the ground. In an experimental area along a stream, most of the flies could be destroyed by spraying the bushes with dieldrin up to 2–3 ft. from the ground. The laboratory rearing of *G. palpalis* was continued, about 2 pupae per female per month being obtained.

The report also contains much interesting information on many other topics.

F. Hawking

Rhodesia & Nyasaland, Federation of. **Report of the Secretary to the Federal Ministry of Agriculture for the Year Ended 30th September, 1960. Pt. 5. Report of the Director of Tsetse and Trypanosomiasis Control and Reclamation for the Year Ended 30th September, 1960** [pp. 224–56, 1 fig. & 3 maps (1 folding)]. 256 pp. 1961. Salisbury: Govt. Printer. [10s. 6d.]

Ann. Trop. Med. & Parasit. 1961, July, v. 55, No. 2, 133–50. [25 refs.] **Report of the First Seminar on Fundamental Research in Trypanosomiasis** [Kershaw, W. E. & Hawking, F., Joint Chairmen] **held under the Auspices of the Tsetse Fly and Trypanosomiasis Committee of the Colonial Office at the National Institute for Medical Research, London, on October 27th, 1960.**

This seminar was designed to collect all persons in the United Kingdom carrying out research on trypanosomiasis, together with as many workers as

possible from the East and West African organizations for trypanosomiasis research. Each worker gave a short account of what he was doing, and of any interesting results which he had recently achieved. Accounts were also given by the directors of the East and West African organizations of the activities of their institutes.

In an abstract it is possible only to indicate the topics which were described. They include the development of polymorphic trypanosomes in culture (R. M. GORDON; M. D. PITTAM); methods of standardizing infections (W. E. ORMEROD); investigations on drug resistance and on photosensitivity induced by acriflavine (F. HAWKING; P. J. WALKER); immunology and antigens of trypanosomes (B. WEITZ; A. R. GRAY; M. P. CUNNINGHAM and K. VICKERMAN; K. N. BROWN); biochemistry (J. D. FULTON; J. WILLIAMSON; P. T. GRANT and J. R. SARGENT; J. F. RYLEY); mode of action of antrycide and phenanthridines (B. A. NEWTON).

For further information the original papers should be consulted as they contain a wide range of new and interesting information. *F. Hawking*

INOKI, S. **Studies on Antigenic Variation in the Welcome Strain of** *Trypanosoma gambiense*. **I. Improvements in Technique.** *Biken's J.* Osaka. 1960, Oct., v. 3, No. 3, 215–22, 3 figs. [10 refs.] **II. On the First Relapse appearing in Mice treated with Human Plasma.** *Ibid.*, 223–8, 1 fig.

Technical details are given of a method of isolation and injection of a single trypanosome. Infections produced in this way were cleared with a standardized dose of a sample of human plasma; relapse invariably occurred, and the times of these relapses were recorded as the number of days after the blood had been cleared, in terms of a normal frequency distribution curve (mode 8 days).

One such relapsed strain was maintained by serial passage in mice: sera were collected from these animals and used for detecting differences in the serotype. After the first relapse a new serotype appeared and persisted for the first 62 passages when a second appeared followed after 66 passages by a third; these serotypes appeared subsequently either alone in the strain or in combination. These combinations could be separated by injection of a single trypanosome [showing thereby that a mixed strain was present rather than a combination of the antigens in the single trypanosome]. *W. E. Ormerod*

LEHMANN, D. L. **Some Culture Differences between** *Trypanosoma rhodesiense* **and** *T. brucei* **in Autoclaved Diphasic Media.** *Ann. Trop. Med. & Parasit.* 1960, Dec., v. 54, No. 4, 419–27, 12 figs. on pl.

Twelve strains of "*brucei* group" trypanosomes isolated in country to the north of Lake Victoria were used in these experiments; they consisted of 1 strain which had been tested and had been found not to infect man, 3 other strains from non-human sources and 8 strains which had been isolated from man. All the strains of human origin and 1 of those of non-human origin had been stored at –70°C. The other 3 strains of non-human origin had been maintained by syringe passage in mice.

The strains were grown in two separate types of medium both of which contained blood that had been autoclaved. Differences in the morphology and behaviour of culture forms were found between the human and non-human

strains. These differences consisted of the type of rosettes present, the ratio between round-ended and point-ended trypanosomes in the early stages of the culture, and the length of survival of the two types in culture.

W. E. Ormerod

GLASGOW, J. P. **Seasonal Changes in the Breeding Places of *Glossina morsitans morsitans* Westwood.** *Acta Tropica.* Basle. 1961, v. 18, No. 3, 252–4, 1 fig.

The East African Trypanosomiasis Research Organization maintains a collecting station for tsetse puparia at Matari, near Singida in Tanganyika. Matari (5,000 feet) is near the upper altitude limit of *Glossina morsitans* and is a small enclave largely surrounded by woodland, and has an annual rainfall of some 750 mm., falling in less than 50 days between December and May.

From 1956 records were kept of 4 types of sites in which puparia were found, namely, under logs, rot-holes in trees, animal burrows and rock-sites (shady places beneath rock outcrops).

The data are shown in figures. The principal finding was that logs were the only productive breeding places during the rains and early dry season: thereafter rot-holes became temporarily the most productive sites and in 4 of the 5 years they produced 60% of all the puparia during that period. In general, burrows and rock-sites were not important.

Grass fires swept the collecting areas early in the dry season and this event closely preceded the abandoning of logs as the only breeding site: but the author points out that the shift could be related to a general drying up " of which the fires are only a symptom ". The return to the logs coincided in general with the onset of the rain.

The dry season importance of rot-holes for *G. swynnertoni* in Shinyanga [BURTT, this *Bulletin*, 1953, v. 50, 287] is recalled.

The present data confirm in general the findings of HARLEY in an area some 10 miles north-east of Matari [*ibid.*, 1955, v. 52, 341]: but in the present study the dramatic abandonment and re-occupation of the logs is notable.

H. J. O'D. Burke-Gaffney

FORD, J. & LEGGATE, B. M. **The Geographical and Climatic Distribution of Trypanosome Infection Rates in *G. morsitans* Group of Tsetse-Flies (*Glossina* Wied., Diptera).** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1961, July, v. 55, No. 4, 383–97, 7 figs. [44 refs.]

" 1) Estimates of trypanosome infection rates in *Glossina morsitans* and *G. pallidipes* in the Zambezi Valley are compared with similar data obtained elsewhere in the *G. morsitans* group of tsetse flies.

" 2) It is demonstrated that a positive correlation exists between infection rates and distance from the median (7°S) of the *Glossina* belt in Africa. Infection rates in *G. pallidipes* in Zululand do not fit this pattern.

" 3) Experimental evidence exists to show that temperature exerts a marked control over the ability of a tsetse fly to acquire an infection. It is demonstrated that the positive correlation with latitude is associated with increasing mean annual temperature. At higher altitudes or, as in Zululand, a situation

approaching the temperate zone, low infections occur as a response to cooler climates.

" 4) The regression of proboscis-type infections on mean annual temperature is much more marked than that of gut and/or gut and proboscis-type infections.

" 5) It is suggested that the mean temperature at which the wild tsetse exists, possibly associated with the range of temperature experienced between seasons, may account for the general level of the infection rate, but that within the same neighbourhood variations may be produced as a result of differences in local fauna providing the trypanosome reservoirs."

[See also this *Bulletin*, 1956, v. 53, 160.]

PAUTRIZEL, R., MATTERN, P. & DURET, J. Diagnostic sérologique de la maladie du sommeil. II. Les anticorps fixant le complément au cours de l'infection. [**Serological Diagnosis of Sleeping Sickness. II. Antibodies Fixing Complement in the Course of Infection**] *Bull. Soc. Path. Exot.* 1960, Sept.–Oct., v. 53, No. 5, 878–85, 1 fig.

The authors have subjected the sera of 53 patients suffering from sleeping sickness in Lower Guinea, West Africa, to complement-fixation tests with antigens prepared by a method described in a previous publication [this *Bulletin*, 1960, v. 57, 687]. The reaction was positive in 44 cases, while in 9 the sera were anti-complementary. In 30 cases the sera were also tested 3 weeks after the patients had been treated with arsobal and cured: the majority showed an appreciable diminution in the antibody titres. The method employed by the authors thus proves to be of considerable diagnostic, as well as of prognostic, value. In view of the high specificity of this test, it is also useful in cases of " clinical suspects ", manifesting symptoms of sleeping sickness in the absence of detectable trypanosomes. The proportion of such cases varied from 10 to 20% of all the patients presenting themselves for treatment.

C. A. Hoare

HOCKING, K. S. **Discriminative Applications of Insecticide against** *Glossina morsitans* **Westw.** *Bull. Entom. Res.* 1961, Apr., v. 52, Pt. 1, 17–22, 2 figs.

This paper reports an important advance in trypanosomiasis control based on the results of careful ecological study [this *Bulletin*, 1958, v. 55, 132, 987]. *Glossina morsitans* belongs to a group of tsetse flies which habitually rest on the lower sides of branches of certain savannah trees. A single application of a 3% dieldrin emulsion to these sites was made throughout a 17-square-mile fly belt in south-western Uganda, rich in game but isolated by encircling rocky hills.

The area was divided into blocks, each of 2 square miles, and having a pair of transect fly paths which were patrolled about 3 times a month to give estimates of fly density.

It was found sufficient to spray only the preferred acacia trees, about 7 of which occurred per acre, and not the associated understorey and thicket. This required a total of 7,800 gallons of the spray diluted from 18% dieldrin as Dieldrex and amounted to 0·2 lb. dieldrin per acre. Chemical analysis showed that 10% of the initial deposit, 0·8 gm. per square metre of treated surface, remained after 4 months, which was probably still lethal on prolonged contact.

The reduction in apparent fly density during the year after spraying was of the order of a hundredfold. The few still caught might have been introduced by wandering buffalo. The basic cost of the operation, without salaries, was about £250 per square mile. Carried out over a wide enough area, this method might lead to complete eradication. *G. A. H. McClelland*

Godfrey, D. G. **Types of *Trypanosoma congolense*. II. Differences in the Courses of Infection.** *Ann. Trop. Med. & Parasit.* 1961, July, v. 55, No. 2, 154–66, 11 figs. [12 refs.]

Having previously demonstrated [this *Bulletin*, 1961, v. 58, 1119] the existence in West Africa of 3 types of *Trypanosoma congolense* separable on morphological grounds, the author now deals with differences in their pathogenicity to cattle, sheep and dogs, infected cyclically by *Glossina morsitans* and to rats inoculated by syringe. It was found that the small *congolense* type had low infectivity, pathogenicity and parasitaemia; the intermediate type had high infectivity and parasitaemia but low pathogenicity, while the long *dimorphon* type had high infectivity, pathogenicity and parasitaemia. *C. A. Hoare*

Schenone, H., Carrasco, J., Dedios, F., Oyarzun, E., Gazaui, A., Madariaga, L. & Ercilla, A. Determinación del límite austral de dispersión del triatomismo domiciliario e infección trypanosómica en Chile. [**Determination of the Southern Limit of Domiciliary Infection with Triatomids and of Trypanosome Infection in Chile**] *Bol. Chileno de Parasit.* 1961, July–Sept., v. 16, No. 3, 59–62, 1 graph. [10 refs.]

The English summary appended to the paper is as follows:—

"During the summer months of 1960, a survey was conducted for determining the triatomid index in human habitations and trypanosome infections in 39 localities in the provinces of O'Higgins, Colchagua and Curicó, so as to determine the Southern limit of their geographical distribution in this country.

"Samples of *Trypanosoma cruzi* were collected in 6 different localities in O'Higgins and Colchagua. The index of *T. cruzi* infection in triatomids varied between 5·4% and 64·9%.

"Xenodiagnosis was applied to 99 individuals and yielded 6 positive results, whereas complement fixation tests for Chagas' disease yielded 29·3% (17 out of 58).

"The limit was established at a place called Rinconada de Yáquil (Colchagua Province), at 34° 36′ S. Lat. (see map. No. 7)."

De Lucena, D. T., Da Rosa, D. & Calheiros, J. N. Epidemiologia da doença de Chagas em Alagoas. II. A endemicidade avaliada pela reação de Guerreiro-Machado. [**The Epidemiology of Chagas's Disease in Alagoas, determined by the Guerreiro-Machado Test**] *Rev. Brasileira Med.* Rio de Janeiro. 1961, Apr., v. 18, No. 4, 258–61. English summary.

A high endemicity of Chagas's disease is reported to exist in the state of Alagoas in north-east Brazil where previous investigations have shown that there is a high percentage of infected triatomids. The authors, wishing to

prove this, collected blood for the Machado-Guerreiro test from persons in 10 towns in different parts of the state. Blood was collected from 3,031 persons of each sex and all ages though mostly from those aged 11–20 years.

Sixteen were unsuitable for testing but of the remaining 3,015, 771 were positive and 577 of these showed a 2-plus result or higher. The authors emphasize this point as they regard people with such positive sera as having an evolutive infective process which becomes evident eventually as a cardiopathy or a "mega" process. Those with the highest percentages of 2-plus or more were aged 31–50 years, and over 60, where out of 51 sera 15 were positive. However, out of 182 sera from children aged 0–10, 26 were positive 2-plus or more. The total percentage positive was higher than in two neighbouring states.

The authors consider that the infection is contracted in childhood or adolescence and that the disease represents a grave public health problem.

W. K. Dunscombe

Wood, S. F. & Wood, Fae D. **Observations on Vectors of Chagas' Disease in the United States. III. New Mexico.** *Amer. J. Trop. Med. & Hyg.* 1961, Mar., v. 10, No. 2, 155–65, 1 map & 15 figs. on 3 pls. [25 refs.]

In New Mexico, over the period 1936 to 1959, 18 *Triatoma protracta protracta* and 5 *T. gerstaeckeri* out of a total of 442 and 17, respectively, were found positive for *Trypanosoma cruzi*. Of 201 *T. p. woodi*, none was positive. Natural infections in wild mammals—by xenodiagnosis—were one plains wood-rat, one suckling white-throated wood-rat (both *Neotoma*) and one rusty antelope squirrel (*Citellus*). Experimentally inoculated white mice developed light blood parasitaemias, or were shown positive only by xenodiagnosis, or histologically. It is suggested that blood smears of wild hosts are not normally a satisfactory method of survey. Young animals, and wood-rats under stress of winter conditions, are likely to reveal their infections more frequently by positive blood. Wood-rat dens were the usual source of these bugs, particularly if humidity (*e.g.*, after wetting with rain) was high. Contact of man with bugs in wood-rat dens is slight in New Mexico, but of 32 bugs actually taken in human dwellings 4 were infected with *T. cruzi*, and the essential sylvan link exists.

[For Papers I and II of the series, on California and on Arizona respectively, see *Bull. Southern California Acad. Sci.*, 1942, v. 41, 61 and this *Bulletin*, 1944, v. 41, 108].

D. S. Bertram

Abalos, J. W. Sobre la importancia epidemiológica de *Triatoma patagónica*. [**Epidemiological Importance of** *Triatoma patagonica*] *Rev. Facul. Med. de Tucumán*. 1959, Dec., v. 2, Nos. 1/4, 19–25, 1 fig. & 1 map. [10 refs.]

The English summary appended to the paper is as follows:—

"The author summarizes the available information on *Triatoma patagonica* Del Ponte, 1929. Considering the anthropophily of the species and the frequency and abundance with which it is found in and near human habitation it is suggested that the species might occupy the ecological niche vacated by *Triatoma infestans*, a purely domestic species, south of the 42 parallel in

Argentina, and that its role as vector of Chagas' disease in the region mentioned ought to be examined."

Deza Cenget, D. & Rojas, R. La biopsia de músculo deltoides en la enfermedad de Chagas. [**Deltoid Muscle Biopsy in Chagas's Disease**] *Rev. Facul. Med. de Tucumán.* 1959, Dec., v. 2, Nos. 1/4, 27–37, 5 figs. English summary.

The authors, the senior of whom is the Professor of Pathological Anatomy in the University of Tucumán, Argentina, examined 27 patients in the Children's Hospital at Tucumán who were proved to have Chagas's disease. These children were aged 5–13 years. Two others with simple goitre and 4 patients with rheumatism [only 32 patients are listed in the table] were also examined for comparison. Two of the patients with rheumatism were adults. Biopsies were taken from the deltoid muscle to determine the possible histological changes, and in some of the in-patients these were repeated, for assessment of progress, at intervals of 30–45 days.

The authors point out that the histoid (schizont) cycle of *Trypanosoma cruzi* does not cause tissue lesions, and this fact is of the first importance in the interpretation of the phenomena which occur where this is evident. The disaggregation of the schizonts and their invasion of the blood stream liberate a sensitizing factor in the tissues which acts as a toxin and has a considerable action on the heart.

In the 27 patients with Chagas's disease only 1 biopsy was negative. The remainder showed interfibrillary muscle lesions, with very variable cytology in the acute periods. Pus formation is extremely rare. After about 30 days there was proliferation of adventitial cells and fixed tissue cells around the capillaries with numerous histiocytes and finally fibroblasts. Granulomata were present in a relatively high proportion in the fat and external perimysium, but no giant cells could be seen.

The lesions were almost constantly present in striated muscle and the authors suggest that deltoid biopsy is not only a complementary diagnostic aid but also gives an idea of the nature and intensity of the organic defences and an indication of the gravity of the possible lesions in the heart muscle.

W. K. Dunscombe

Landa, C. R. Fisiopatología de la insuficiencia cardíaca crónica congestiva. [**Physiopathology of Chronic Congestive Cardiac Insufficiency**] *Rev. Facul. Med. de Tucumán.* 1959, Dec., v. 2, Nos. 1/4, 39–100.

A comprehensive discussion and review of the literature.

Cossio, F., Canal Feijóo, E. & Lazzari, J. O. Vectocardiografía espacial en la enfermedad de Chagas. [**Vectocardiographic Studies in Chagas's Disease**] *Rev. Facul. Med. de Tucumán.* 1959, Dec., v. 2, Nos. 1/4, 235–44, 5 figs. [16 refs.]

The English summary appended to the paper is as follows:—

"This paper deals with a vectocardiographic study performed in 27 patients with Chagas' disease, diagnosed by means of the observation of S. Cruzi in

blood smear or by xenodiagnosis. The patient's age and the time of evolution of the disease were taken into consideration, and it was found that, independent of these two factors, in 88·89% of the cases permanent, and to a certain point characteristic, vectocardiographic alterations can be recorded. Thereby we can accurately interpret some alterations recorded electrocardiographically, that are attributed to conduction trouble, which appears simultaneously with characteristic modification of tissues."

AMREIN, Y. U. **Attempts at Interspecies Genetic Transfer in Trypanosomes.** [Research Notes.] *J. Parasitology*. 1961, Aug., v. 47, No. 4, Sect. 1, 572.

Reports have already been made on what appears to be intraspecies genetic transfer mediated by nucleic acid among trypanosome and trichomonad flagellates [this *Bulletin*, 1961, v. 58, 32].

The present author, from the Department of Zoology, Pomona College, Claremont, California, records an attempt to effect interspecies transfer mediated by nucleic acid between *Trypanosoma cruzi* and *T. lewisi*. Nucleic acids, precipitated with ethanol and stored in saline, were prepared from lysed cultures of *T. cruzi*. Blood forms of *T. lewisi* were obtained by cardiac puncture from experimentally infected rats. A small amount of *T. cruzi* nucleic acid preparation was added either to citrated blood of the infected rats or to a buffered saline Armour plasma fraction V medium to which washed *T. lewisi* had been added. This mixture of live *T. lewisi* and nucleic acid from *T. cruzi* was kept at temperatures of 25°, 30° and 37°C. for periods up to 12 hours and then injected intraperitoneally into C3H mice and also fed through membranes to clean nymphs and adults of *Triatoma protracta*.

T. lewisi does not usually produce infection in mice or triatomid bugs, so that appearance of appropriate stages of trypanosomes in blood or myocardium of mice or in the triatomid host in 10 to 20 days would be evidence of transfer of infectivity *via* nucleic acid from *T. cruzi* to *T. lewisi*. However, in 10 experiments with 6 separate nucleic acid preparations, 48 mice and 100 *T. protracta*, no such transfer was found. *H. J. O'D. Burke-Gaffney*

YAEGER, R. G. & MILLER, O. N. **Effect of Malnutrition on Susceptibility of Rats to *Trypanosoma cruzi*. III. Pantothenate Deficiency.** *Exper. Parasit.* New York. 1960, Oct., v. 10, No. 2, 232–7, 1 fig. **IV. Pyridoxine Deficiency.** *Ibid.*, 238–44, 1 fig.

This series of papers describes the effect of various vitamin deficiencies on the growth of *Trypanosoma cruzi* in a strain of rats. The first paper dealing with thiamine deficiency appeared earlier [this *Bulletin*, 1961, v. 58, 38].

Riboflavine deficiency had no effect on the severity of the infection, and although the deficient rats showed more severe heart lesions this was probably due to inanition rather than to any specific effect of the deficiency. On the other hand both pantothenate and pyridoxine deficiencies caused a heavier parasitaemia to develop, and produced more severe lesions in the hearts of deficient rats.

[These experiments are carefully described and avoid many of the difficulties inherent in the interpretation of nutritional experiments.] *W. E. Ormerod*

Rubio, Mafalda & Knierim, Feliza. Estudio serológico en hamsters o cricetos (*Cricetus auratus*) inoculados con cultivos de *Trypanosoma cruzi*. [**Serological Studies on Hamsters Inoculated with Cultures of** *Trypanosoma cruzi*] *Biológica*. Santiago. 1960, July, No. 29, 30–37. [21 refs.] English summary.

40 hamsters (2½–3 months old) were inoculated with a culture of *Trypanosoma cruzi* (Peruvian strain) on Senekjie's medium, 90% of the culture being in the crithidial form. Half of the animals received three doses. at 72 hour-intervals, of a total of 2,564 × 10^6 organisms; the other half received a single dose of 38 × 10^6. Serological reactions were then observed at different intervals. Agglutination took place at a maximum titre of 1 in 640 in the sera of hamsters which had received the higher immunizing dose, compared with a titre of 1 in 160 in animals which had received a lower dose (between the 25th and 60th days). Complement-fixation tests were positive to the same degree in both groups (1 in 160 on the 60th day), while precipitin tests were negative.

Similar observations, carried out on rats injected with Peruvian and Tulahuén strains of *T. cruzi*, showed that higher titres in the agglutination and complement-fixations reactions, and positive precipitin tests were produced in the sera of these animals.

This preliminary work will serve as an index for measuring immunity and phagocytic activity in inoculated animals—the second part of the enquiry.

P. C. C. Garnham

Deane, L. M. & Damasceno, R. G. Tripanosomídeos de mamíferos de Região Amazônica. II. Tripanosomas de macaos da Zona do Salgado, Estado do Pará. [**Mammalian Trypanosomidae from the Amazon Region of Brazil. II. Trypanosomes of Monkeys from the Salgado Zone, State of Pará**] *Rev. Inst. Med. Trop. São Paulo*. 1961, Mar.–Apr., v. 3, No. 2, 61–70. 27 figs. [32 refs.]

The English summary appended to the paper is as follows:—

"Searching for malaria infections, the authors examined the blood of monkeys and other wild mammals from the Salgado Zone, coast of the State of Pará, Amazon Region of Brazil. No plasmodia were found, but the following *Trypanosomidae* were recorded: *Trypanosoma saimirii* Rodhain, 1941, in the squirrel-monkey *Saimiri sciureus sciureus* (L.); *T. diasi* Deane & Martins, 1952, in the capuchin-monkey *Cebus apella apella* (L.); *T. devei* Leger & Porry, 1918, in the tamarin *Leontocebus tamarin tamarin* (Link); *T. mycetae* Brumpt, 1913, in the howler-monkey *Alouatta belzebul belzebul* (L.) and *Endotrypanum schaudinni* Mesnil & Brimont, 1908, in the two-toed sloth *Choloevus didactylus* (L.).

"The authors comment on the morphology and biology of the above hemoflagellates and emphasize that the present finding of *T. saimirii* increases the number of species of trypanosomes of the Amazon Region of Brazil known to develop in triatomid bugs, those previously known being the *cruzi*-like and *rangeli*-like trypanosomes, *T. diasi* and *T. conorrhini*."

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, mucocutaneous.

AMARAL, A. D. F., TORREALBA, J. W., HENRÍQUEZ, C. E., KOWALENKO, W. & BARRIOS, P. A. **Studies on Visceral Leishmaniasis in Venezuela.** *Rev. Inst. Med. Trop. São Paulo.* 1961, Mar.–Apr., v. 3, No. 2, 91–8, 1 fig. [21 refs.]

The authors first point out that visceral leishmaniasis has been known in Venezuela since 1941 and that at the present time cases have been reported from 8 states and the Federal District. As the incidence seemed to be fairly high in Guarico state they started investigations there into the epidemiology of the disease in October, 1960.

In view of their importance as reservoirs of the disease a number of dogs in villages and hamlets were examined as follows: the dogs were first anaesthetized by intraperitoneal injection of nembutal 30 mgm. per kgm. body weight, the drug being dissolved in saline to give a concentration of 25 mgm. per ml., its effects lasting from 30 minutes to 4 hours. While they were under the anaesthetic the tibial bone marrow and the liver were punctured, a biopsy was taken from the skin of the ear, and thick blood films were made. Of 112 dogs so treated 12 were positive for *Leishmania*, probably *L. donovani*, 11 by bone-marrow puncture and 1 where only skin biopsy was positive. The liver was positive in 6, and in 2, only the bone marrow was positive.

In addition a number of sandflies were captured which will be the subject of later reports, but the authors mention that *Phlebotomus longipalpis* which is a vector of the disease in other tropical countries is frequently found in the affected regions. 6 new human cases were found between October and December and the authors mention that the age distribution is similar to that of the Mediterranean form. *W. K. Dunscombe*

SEN, Anjali & MUKERJEE, S. **Observation on Antigenic Differentiation of *Leishmania* Parasites of Kala-Azar and Post-Kala-Azar Dermal Leishmaniasis.** *Ann. Biochem. & Exper. Med.* Calcutta. 1961, Apr., v. 21, No. 4, 105–8.

Variations in antigenic character of *Leishmania* parasites belonging to different species have been described [this *Bulletin*, 1926, v. 23, 581; 1927, v. 24, 139; 1930, v. 27, 620]. The present author has undertaken a study of leishmanial forms present in visceral leishmaniasis and in post-kala-azar dermal leishmaniasis, to find if any such difference could be correlated with change in habitat of the parasite. Immune serum was prepared in rabbits from each, cultures being used as the source of antigen. After 6 infections over a period of 3 weeks the animals were bled 10 days later. The agglutinin titres against each strain were determined. Cross absorption experiments with the 2 antigens were also performed. The results indicated that the antigens differed in their reactions. Each possessed a similar major component and a strain-specific minor fraction. *J. D. Fulton*

RODRIGUES DA SILVA, J. & DE PAOLA, D. **Hepatic Lesions in American Kala-Azar: a Needle-Biopsy Study.** *Ann. Trop. Med. & Parasit.* 1961, July, v. 55, No. 2, 249–55, 7 figs. on 2 pls. [29 refs.]

American kala azar has until recently been considered an uncommon disease. The little known of the hepatic pathology of this condition suggests its affinity to that of the kala azar seen in the Mediterranean and the Orient.

The authors have done needle liver biopsies on 30 local patients with kala azar in Brazil. There was one Negro among these, 7 whites, and the rest were mulattoes ; 6 were adults under 33 years old, 2 were 14–16 years, and 22 between 30 months and 11 years old. 24 were males and only 6 females. The probable duration of the disease in all but 2 cases was under 4 years; in 21 of them it was 3–8 months.

In all patients the spleen and the liver were enlarged, the spleen markedly so in 19 and the liver in 17. In all patients the diagnosis was established by identification of *Leishmania donovani* in the marrow or the liver. Liver biopsy was done on 8 patients before treatment, on 16 during treatment, and on 6 during the month after treatment. Study of this material did not show any significant departure from similar material obtained from patients with kala azar acquired elsewhere in the world. The picture was complicated in 6 cases by a concurrent *Schistosoma mansoni* infection; in 4 of these granulomata containing eggs were found. In patients regarded as cured of their kala azar by specific treatment the livers slowly reverted to a normal histological appearance.

A. R. D. Adams

Pacheco Cartín, M., Céspedes Fonseca, R. & Calderón, H. Leishmaniosis cutánea. Lesiones hepáticas concomitantes estudiadas en biopsia con aguja de Vim Silverman. Resultados terapéuticos con Repodral y Pirimetamina. Análisis de 173 casos. **[Concomitant Hepatic Lesions in Cutaneous Leishmaniasis Studied by Liver Biopsy]** *Acta Méd. Costarricense*. 1961, Jan.–Apr., v. 4, No. 1, 3–23, 19 figs. on 5 pls.

The English summary appended to the paper is as follows:—

"Clinical and epidemiologic studies, smears and biopsies from the lesions and liver biopsies were done on 173 cases of cutaneous leishmaniasis from the southeastern region of Costa Rica.

"Most patients were over 15 yr. old (65.31%) and lesions were predominantly located on the lower extremities (63%); ulcers on the ears and nose were not frequent. In more than half the cases duration of illness was from 1 month to 1 year. Most lesions were ulcerative (79.19%); verrucous lesions were seen in 8.09%. Multiple lesions were found in 50.87%.

"In 43% of liver biopsies obtained with the Vim Silverman needle, focal hepatitis was found and leishmaniform bodies were seen in 27.45% of these cases (11.66% of the total). In order to prove that these bodies are or are not leishmanias, it is suggested that pieces of liver biopsies be cultured.

"Cures were obtained in 60.65% of cases treated with Repodral and in 65.78% of those treated with Pyrimethamine. This drug is effective more rapidly, is taken orally and can be administered at home. The use of both drugs at the same time had no advantage.

"This disease is increasing markedly in this country and it is becoming a serious national problem."

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

MELNOTTE, P. & FOLIGUET, J. M. Les rickettsioses. Considérations générales. [**General Observations on Rickettsial Diseases**] *Maroc Méd.* 1961, Sept., v. 40, No. 436, 897–903.

A general review with special reference to varied symptomatology.

BLANC, G. Les rickettsioses au Maroc. [**Rickettsial Diseases in Morocco**] *Maroc Méd.* 1961, Sept., v. 40, No. 436, 904–13, 3 figs. [92 refs.]

A historical review.

OSIPYAN, V. T., KAZHDAN, B. V. & DUNAEVA, I. D. **Butadione—an Effective Agent against Body Lice.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1960, v. 31, No. 7, 1215–19. [Translated from Russian.]

The authors record from 76% to 100% mortality, after 24 hours, in adult body-lice fed on volunteers who had taken 0·5 or 1·0 gm. of phenylbutazone (Butadione) orally 1 to 5 days before the trial feeds. High mortalities, over 50%, were found in batches of lice fed 6 to 12 days after an oral dose of 1 gm. of phenylbutazone in the volunteers. A dose of 0·5 gm. did not produce similar high mortalities after 5 days. Mortality in batches of lice fed on the volunteers before administration of phenylbutazone was between 0% and 6%.

The toxicity of phenylbutazone in the blood of volunteers to larval lice was found to be the same as that to adult lice, except that larval lice that had not fed previously were less sensitive to phenylbutazone than larvae fed previously on normal blood.

Phenylbutazone was found to be not toxic to rodent fleas and bedbugs [see also this *Bulletin*, 1957, v. 54, 1024]. The authors suggest that the drug should be used as a systemic insecticide during epidemics of louse-borne typhus, but they also say that the optimum dosage should be further worked out.

Phenylbutazone is 1,2-diphenyl-4-*n*-butyl-3, 5-pyrazolidinedione and is also produced under the names of Butalidone, Butazolidin, Pyrazolidine and Butadione [the name used in this paper]. *B. R. Laurence*

FOX, I. & GARCÍA-MOLL, Ileana. **Rat Ectoparasite Surveys in relation to Murine Typhus Fever in Puerto Rico.** *Amer. J. Trop. Med. & Hyg.* 1961, July, v. 10, No. 4, 566–73, 6 figs. [17 refs.]

Murine typhus has disappeared in San Juan, Puerto Rico, yet DDT dusting for rat fleas has never been instituted and rat control measures have been unsuccessful. A comparison of the flea fauna of rats trapped on San Juan Islet and in Santurce in the years 1957 to 1960 and in the years 1946 to 1947 and

1954 to 1955 [this *Bulletin*, 1957, v. 54, 276] is given here. This shows that, in both localities, the population of *Xenopsylla cheopis* has declined since 1946, although the rat population has remained high and some ectoparasites, notably the rat mite *Laelaps nuttalli*, have increased.

There have been no human cases of murine typhus reported from the city of San Juan between 1954 and 1960 and none in Puerto Rico as a whole in 1958, 1959 and 1960. This follows the trend in the decline of murine typhus cases in the United States as a whole. The authors do not think that the decline in the population of *X. cheopis* can be attributed to other insecticidal control measures used in Puerto Rico, but that the reasons for the change in population should be searched for in the interactions between the rat fleas and the other ectoparasites associated with them. These other ectoparasites do not appear to play a significant part in the transmission of murine typhus from rat to rat.

B. R. Laurence

YAMAGUCHI, T. **Studies on Tsutsugamushi in Shikoku (3). Seasonal Distribution of Trombiculid Mites in Several Districts of Shikoku.** *Tokushima J. Exper. Med.* 1961, Feb., v. 7, No. 4, 301–13, 10 figs. [10 refs.]

During 5 years 1953–1958 nearly 64,000 trombiculid mites were collected from rodents on Shikoku and adjacent Awaji island. There were 20 species of mites belonging to 4 genera. Two species, *Trombicula tosa* and *T. pallida*, are considered to be vectors of tsutsugamushi disease. The rodent hosts belonged to 6 species of which the wood-mouse *Apodemus speciosus* was much the commonest.

Trapping of the rodents was carried on throughout the year, and the largest number of mites was found from autumn to spring. Graphs of seasonal distribution are given individually for the commoner species of mites at four different localities. The graphs show small numbers of mites during the summer months, with peaks of abundance in autumn, winter or spring, varying with the species and locality.

J. A. Reid

TAILYOUR, Joan M. **Q Fever Serum Antibodies in British Columbia Cattle.** *Canadian J. Pub. Health.* 1961, July, v. 52, No. 7, 304–6. [12 refs.]

In connexion with a study in the epidemiology of Q fever carried out by the U.S. Public Health Service [see also this *Bulletin*, 1961, v. 58, 903], studies were made in British Columbia, Canada, by means of the capillary tube agglutination test. Between November 1959 and June 1960, all bovine sera received for testing for brucellosis in the Federal and Provincial Animal Pathology Laboratories in Vancouver were tested for Q fever antibodies. Sera were taken from 18,211 animals on 2,595 farms in the Province. Pooled milks from 325 dairy herds were also examined, but all were negative.

Among cattle sera from 11 areas, 2·4% were positive and 6·2% of 6,211 samples from the Fraser Valley area were positive, which accounted for 88% of the positive findings. Among 9 herds (8 from Fraser Valley and 1 from Vancouver Island), 293 of the total 439 reactors were found. The percentage of

reactors varied from 14% to 43%. Although these 9 herds represented only 0·35% of the total farms surveyed, they harboured 66·7% of the animals with Q fever antibodies.

[For a study of dairy herds in Ontario, see *ibid.*, 1960, v. 57, 892.]

H. J. O'D. Burke-Gaffney

LUOTO, L. & PICKENS, E. G. **A Résumé of Recent Research seeking to define the Q Fever Problem.** *Amer. J. Hyg.* 1961, July, v. 74, No. 1, 43–9. [25 refs.]

Serological studies have shown that bovine Q fever is widespread in the United States and that in certain areas (*e.g.*, Montana) the trend is towards a steadily increasing infection rate. The public health significance of the bovine infection has yet to be defined, the incidence of the disease in man varying markedly in areas where bovine infection is endemic. This article gives a useful summary of the current situation, emphasizing the need for further work to determine " whether Q fever is becoming a nationwide human health problem or if it constitutes only a well-balanced host-parasite relationship among live-stock and in nature ".

[See also this *Bulletin*, 1960, v. 57, 802.] *R. S. F. Hennessey*

DENGUE AND ALLIED FEVERS

MILLER, J. K., TOMPKINS, V. N. & SIERACKI, J. C. **Pathology of Colorado Tick Fever in Experimental Animals.** *Arch. Pathology.* 1961, Aug., v. 72, No. 2, 149–57, 4 figs. (1 coloured on 2 pls.) [19 refs.]

Intracerebral inoculation of mice and hamsters with Colorado tick fever virus produced lesions similar to those caused by louping-ill virus. Subcortical vascular engorgement and petechial haemorrhages occurred in the cerebrum, and destruction of Purkinje cells and the granular layer in the cerebellum. Local ischaemic necrosis was a characteristic lesion in the mouse, haemorrhages being more prominent in the hamster. Intracytoplasmic fuchsinophilic inclusion bodies were present in Purkinje cells and in neurones of the hippocampus and pons. Similar lesions were seen in mice inoculated intraperitoneally with the virus. Guineapigs were susceptible to intracerebral but not to intraperitoneal inoculation, while rabbits and lambs were insusceptible to inoculation by either route. Lesions were more severe in suckling than in adult mice.

Sheep and human louping-ill antisera had no demonstrable neutralizing action against Colorado tick fever virus; rabies antisera also showed no activity against the virus. *R. S. F. Hennessey*

RABIES

KUWERT, E. & WINKLER, Christa. Über den Einfluss des Serumzusatzes bei der Titration des Tollwutvirus. **[The Effect of the Addition of Serum in the Titration of Rabies Virus]** *Ztschr. f.d.g. Hyg. u. ihre Grenzgebiete.* Berlin. 1961, Feb., v. 7, No. 2, 147–58, 2 figs. [24 refs.]

An investigation has been made of the effect of adding 2% inactivated guineapig serum to the diluent upon the results of titrations of the Novi Sad, Pitman-Moore, Budapest and Flury strains of fixed rabies virus. In 52 of 53 titrations carried out in parallel, using as diluent isotonic *p*H 7·6 phosphate buffer alone and with the addition of serum, titres higher by 1 log unit or so were obtained by the addition of serum. The means of the pooled values of all the titres for all the strains and virus preparations used were 2·71 ± 0·24 with phosphate buffer, and 3·78 ± 0·27 with buffer containing 2% serum.

D. J. Bauer

SCHNURRENBERGER, P. R., ANDERSON, G. R., RUSSELL, J. H. & WENTWORTH, F. H. **Avian Embryo Rabies Immunization. II. A Comparison of the Antigenicity of High Egg-Passage and Duck-Embryo Vaccines administered intradermally in Man.** *Amer. J. Hyg.* 1961, July, v. 74, No. 1, 1–6, 1 fig. [15 refs.]

Previous studies [this *Bulletin*, 1955, v. 52, 970; 1957, v. 54, 420] had demonstrated the feasibility of avian embryo pre-exposure rabies vaccination in man. The present study was undertaken to compare: (a) the antigenicity of duck-embryo vaccine (DEV) with that of high egg passage (HEP) chick-embryo vaccine in a selected pre-exposure human group and (b) the results of 3 participating laboratories performing the serum neutralization test (SN) in parallel on blood samples obtained pre- and post-vaccination, with a view to ascertaining the sensitivity and reproducibility of this test.

The HEP vaccine used in the experiments was prepared from the Flury strain attenuated by 180–210 passages on chick embryos, the DEV from the CVS strain of fixed virus, grown on duck embryos and inactivated with beta propiolactone. Both vaccines were administered in a series of 4 intradermal inoculations, each of 0·2 ml., the primary series of 3 inoculations being given at 5-day intervals and the fourth or booster dose 171 days after the original inoculation. Blood samples were obtained: before vaccination, 31 days after the first inoculation, just before the booster dose and 7 and 30 days after the booster. Aliquots from each serum specimen were sent to 3 different laboratories for performance of the SN test. In the SN test 4-fold dilutions of serum were mixed with an equal volume of CVS fixed rabies virus (diluted in 10% inactivated guineapig serum in saline) and incubated in a water bath at 37°C. for 90 minutes; 0·03 ml. of the serum-virus mixture was then inoculated intracerebrally into Swiss white mice, which were thereafter observed for 15 days; the 50% mortality end-points were calculated according to the method of Reed and Muench; and the antibody titre of the serum was expressed as the reciprocal of the final serum dilution protecting 50% of the mice. In the SN test the LD50 of challenge virus used by the 3 participating laboratories was, respectively, 100, 100–300 and 300.

As regards (a): results obtained by all 3 laboratories in the pre-booster sera failed to demonstrate a significant difference in antibody response between the groups receiving DEV and HEP vaccine respectively. Moreover there was no essential difference between the antibody titres obtained in the 2 groups 7 and 30 days after the fourth (the booster) inoculation.

As regards (b): the relative sensitivity of the techniques employed by the 3 laboratories was demonstrated by the geometric mean antibody titres reported on sera obtained 31 days after primary inoculation, *viz.*, 1 in 5·2, 1 in 3·6 and 1 in 3·1, respectively. As was to be expected, the height of titre varied inversely with the dosage of challenge virus. Despite these differences the results were quite comparable: 2 laboratories agreed within a 4-fold dilution in 84·7% of 374 sera, 2 had 71·7% agreement on 109 sera, and 2 had 90·2% agreement on 101 sera.

[For Part I, see this *Bulletin*, 1960, v. 57, 899.] *G. Stuart*

CHRIST, P., HARNONCOURT, K., SIMROCK, W. & WACHENDÖRFER, G. Erfahrungen mit der Tollwutprophylaxe. [**Observations on Rabies Prophylaxis**] *Deut. med. Woch.* 1961, Apr. 21, v. 86, No. 16, 803–12, 838, 1 fig. [Numerous refs.]

As a result of a marked increase in the incidence of rabies in wild and domestic animals in South Hessen, Germany, since 1953, 412 persons have been considered for treatment with rabies vaccine. Contact with a rabid animal was established in 157 persons (38%); 69 animals were concerned, including 27 foxes, 19 deer, 11 cats, 6 dogs, 4 cattle, 1 badger and 1 laboratory mouse, the diagnosis being established in all cases by the demonstration of Negri bodies or by animal experiments. In 114 persons vaccination was discontinued after the animal concerned had been found to be unaffected by rabies. 279 persons (68%) were given Hempt vaccine. Among 219 who remained under observation, 46 (21%) developed a reaction, including erythema and oedema at the site of injection (13%), and general reactions with urticaria, headache and fever (8%); in 5 persons vaccination had to be discontinued on account of the severity of the reaction. No case of rabies occurred among the vaccinated persons, although 33 had been exposed to very great risk of infection. *D. J. Bauer*

SEGGIARO, J. A., COSTAL, M. J. & PUPARELI, L. A. Las complicaciones neurológicas de la vacunación antirrábica. [**Neurological Complications of Antirabic Vaccination**] *Rev. Facul. Med. de Tucumán.* 1959, Dec., v. 2, Nos. 1/4, 165–79. [31 refs.] English summary (7 lines).

The authors point out that the type and dosage of the vaccine used are of major importance in paralytic accidents during or after antirabic vaccination and they state that the theory with the greatest number of adherents at the moment is the allergic one. The histopathology is common to many virus infections and allergic conditions, but from the clinical point of view the better educated patients are more liable.

4 main types of affection can be distinguished: (a) peripheral neuritis affecting limbs, face, optic nerve, etc., resembling the Guillain-Barré syndrome; (b) dorso-lumbar myelitis; (c) ascending paralysis of the Landry type; (d) encephalitis. Mixed forms may also occur. Treatment, in view of the probable allergic nature, involves the use of antibiotics, antihistaminics, steroids, combined with vitamin B complex. Temporary suspension of the inoculations may be necessary but if it is decided to continue them the treatment mentioned above plus desensitization is suggested. The authors then describe 7 cases, all in adult males, which occurred at their antirabic Institute at Tucumán between 1955 and 1958 out of 1,506 persons inoculated. Pasteur treatment, with a virus inactivated with formol, was given. 3 patients developed transverse myelitis, 2 facial paralysis, and 2 polyneuritis. All subsequently recovered and the authors mention the benign course in all. Treatment was interrupted for varying periods in 3 patients.

[The authors do not furnish any proof that the animals concerned were in fact rabid, and in 2 instances the dogs only slobbered over the patients. After some not inconsiderable experience the reviewer remains of the opinion that if a person has received a *deep* bite (epidermis penetrated), on *bare* skin, by an animal proved rabid by animal inoculation the risk is so grave that nothing must interfere with vaccination.] *W. K. Dunscombe*

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

JACKSON, S. & MORRIS, B. C. **Enhancement of Growth of *Pasteurella pestis* and other Bacteria in Serum by the Addition of Iron.** *Brit. J. Exper. Path.* 1961, Aug., v. 42, No. 4, 363–8.

The senior author with Burrows had previously shown that non-pigmented colony-variants of pigmented colonies of *Pasteurella pestis*, fully virulent for mice when grown on a suitable medium at 28°C., multiplied less freely in the mouse and were significantly less virulent for this animal. Further they showed that if the variant was injected together with an iron compound, growth in the mouse was normal and its virulence was equal to that of its parent strain [JACKSON and BURROWS, this *Bulletin*, 1957, v. 54, 565, 566]. The present paper is an extension of this work and studies the mechanism of the iron effect by observations on growth in fresh serum.

It was found that the growth of *P. pestis* in human serum at 37°C. was very limited unless iron was added to the medium, in which case growth was much enhanced. Although there were strain differences the effect of added iron on growth appeared to be independent of virulence, but the enhancement of growth was greater with a pigmented strain with an LD50 of 10 organisms than with an unpigmented variant with an LD50 of 10^3–10^7 organisms.

It is of interest to note that not only was a similar effect seen with *P. pseudotuberculosis*, but also with *Salmonella typhi-murium*. With *Staphylococcus aureus* the effect was slight and with *Escherichia coli* and one of the *Shigella* sp. there was no growth in human serum whether iron was present or not.

It will be recalled, however, that some strains of *E. coli* are very susceptible to the bactericidal effect of fresh human serum [see COLEBROOK *et al.*, *Bull. Hyg.*, 1961, v. 36, 477]. *H. J. Bensted*

HUDSON, B. W. **Column Adsorption of Fluorescein-Isothiocyanate-Labelled Antibodies.** *Bull. World Health Organization*. Geneva. 1961, v. 24, No. 2, 291–2, 1 fig.

Anti-plague globulin fractions labelled with fluorescein isothiocyanate were added to chromatographic columns after acetone powders of beef and rat livers, mixed with diatomite filter aid and slurried in phosphate-buffered normal saline, had been poured into the columns. The fluorescent zones eluted from the columns gave brilliant fluorescent staining of *Pasteurella pestis* organisms present in cultures and in smears of all types of tissue. Non-specific fluorescent staining of normal tissue components in blood, spleen, liver, lung, kidneys, peritoneal fluids, lymph nodes and bone-marrow smears from laboratory mice, rats, guinea-pigs, hamsters and 6 species of wild rodents was reduced to negligible levels.

This technique has proved particularly valuable in epidemiological investigations into human plague occurring after a rodent epidemic has died down. In such cases plague detection may depend on the processing of mummified or decomposed animal carcasses, but without the adsorption of the brilliant non-specific fluorescent staining of normal tissue components in lymph nodes and bone marrow the technique cannot be usefully applied and the method outlined above is considered to be a valuable advance. *H. J. Bensted*

SEAL, S. C. **Recent Developments in the Study of Antigenic Structure of Plague Bacillus and the Necessity for evolving a Standard Method of Isolation of the Antigens.** *Indian J. Med. Sci.* 1960, Sept., v. 14, No. 9, 765–75, 1 fig. [53 refs.]

The author of this article is a well-known research worker on the antigenic structure of the plague bacillus who has been on the staff of the All India Institute of Hygiene and Public Health, Calcutta, for a number of years. The article itself does not disclose any new information on the subject; it is not substantially different from that part of his article, dealing with the antigenic structure of *Pasteurella pestis*, which appeared in the Souvenir publication celebrating the Haffkine Institute Diamond Jubilee 1899–1959 [this *Bulletin*, 1960, v. 57, 1261].

The author does not appear to have considered any of the important work which has been published since 1957 and only gives one bare reference to the agar-gel precipitation technique, and this without comment. Thus the title of the article is rather misleading and it is unfortunate that none of the recent British research is mentioned.

The antigenic structure of the plague bacillus has long been studied and various workers have isolated a number of antigen fractions by different methods and the author stresses the importance of standardizing methods to ensure uniformity and comparability of results.

[While there is much to be said for this method of approach, it would seem that the chemical isolation of antigen fractions must first be related to the precipitation lines obtained by the agar-gel diffusion technique. Much seems to be promised by the full exploitation of this technique.] *H. J. Bensted*

Levi, M. I., Chekomasova, A. V. & Vasil'ev, N. V. **A Study of the Possibility of increasing the Viability and Antigenicity of Live Avirulent Plague Vaccine—Passage of Vaccine Strain 1 in White Mice.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1960, v. 31, No. 8, 1512–20. [Translated from Russian.]

This paper describes some carefully conducted mouse-agar-mouse passage experiments with the avirulent vaccine strain No. 1 *Pasteurella pestis*, which appears to be widely used in the U.S.S.R. At various stages of the passage experiments the distribution (and the extent of the distribution in relation to the dose injected) throughout the tissues of the mice was examined and the LD50 was estimated. The antigenicity of the passaged strain at three stages of the mouse passage in terms of mouse protection was also examined and subjected to some statistical treatment.

The results may be summarized by saying that continuous passage of the avirulent strain led to increased invasive ability of the organism and increased growth response in the mouse. The difference in the number of organisms in the various preparations which protected 50% of the animals immunized was so great after the 11th and 31st passages that there seemed to be no doubt that as a result of passage the antigenicity of the strain was also increased. In a critical assessment of the LD50 during the continuous passage there was no statistical evidence to suggest that the mouse virulence of the strain increased as a result of the passage. *H. J. Bensted*

Chen, T. H., Foster, L. E. & Meyer, K. F. **Experimental Comparison of the Immunogenicity of Antigens in the Residue of Ultrasonated Avirulent *Pasteurella pestis* with a Vaccine prepared with Killed Virulent Whole Organisms.** *J. Immunology*. 1961, July, v. 87, No. 1, 64–71, 1 fig. [14 refs.]

This paper is concerned with a comparison of the toxic and immunogenic properties of a whole-organism vaccine made from formalin-killed virulent cultures of *Pasteurella pestis* and vaccines made from antigen residues obtained by the ultrasonic treatment of cultures of avirulent strains of *P. pestis* (Tjwidej and EV 76). The ultrasonic method of treatment followed that described by Keppie *et al.* [this *Bulletin*, 1958, v. 55, 650]. The preparation of the whole-organism vaccine is not described in detail. The method was developed at the Hooper Foundation and the manufacture is a joint undertaking by the Hooper

Foundation and the Cutter Laboratories and is said to be a fully controlled standardized procedure. The antigen components of all preparations were determined by the gel diffusion technique.

The ultrasonic preparations were found to be non-toxic for both guineapigs and mice and the immunogenic properties are reported as satisfactory. In the vaccine potency tests, although there were only negligible differences between the ultrasonic preparations and the acetone-dried standard antigen, the whole-organism virulent vaccine was markedly superior in its mouse-protecting qualities. The immunity conferred by the various vaccines was found to be directly related to Fraction I antibody.

[It is of interest to recall that BUCKLAND and TREADWELL in a recent publication (*ibid.*, 1961, v. 58, 1130) on the comparison of different plague vaccines, were examining much the same sort of problem, although their avirulent vaccines were not ultrasonically-treated preparations. There was no question about the superiority of the vaccine prepared from the highly virulent strains, L37 or MP6, as compared with those made from avirulent strains. These authors' difficulties arose out of the great variations in the LD50 for mice of the very carefully prepared challenge for the mouse-protection tests. In the paper under review the main object of the experiments was not quite the same and this difficulty of being unable properly to standardize the challenge dose for the mouse-protection test was less important than in Buckland and Treadwell's studies.] *H. J. Bensted*

KOZLOV, M. P., LEMEKHOVA, A. E. & NOROVD, D. **The Relationship between the Vaccine Reaction and Allergic Reactions in Persons inoculated with Plague Vaccine.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1960, v. 31, No. 8, 1508–12. [Translated from Russian.]

The plague vaccine used by the authors of this paper appears to be a live dried vaccine, presumably reconstituted just before the injections are given intradermally, but no information is given about the method of preparation or the strain of *Pasteurella pestis* used. Several avirulent strains are used for living plague vaccines in the U.S.S.R., including the EB strain [which may be the same as the internationally known EV strain]. The allergic reactions were determined by the use of pestin, an extract of the particular vaccine strain used in the present experiments.

The post-vaccinal reactions are expressed in terms of the size of the infiltrated area of skin at the site of the intradermal inoculation on the second day after vaccination (87% of all inoculated persons showed an infiltrated area of 25–100 $cm.^2$). The allergic reaction was maximal at about a month after vaccination and gradually began to fade after this interval. At the end of a year 60% of those vaccinated gave a negative pestin test and in the remainder the reaction was very slight. The duration of the period during which a pestin reaction could be observed was to some extent related to the intensity of the post-vaccinal reaction but the period coincided with the period of maximal immunity. Thus, according to the authors, the pestin reaction was a valuable guide to the degree of immunity induced by the vaccination, but no supporting evidence for this claim is given. *H. J. Bensted*

GALLUT, J. & GIRARD, G. Action de la chlorpromazine (CPZ) sur l'intoxication et l'infection expérimentales de la souris par *Pasteurella pestis* (souche vaccinale EV). [**Action of Chlorpromazine (CPZ) on Experimental Infection of Mice with *Pasteurella pestis* (Vaccinal EV Strain)**] *Ann. Inst. Pasteur.* 1961, May, v. 100, No. 5, 672–6.

In a previous paper Gallut [this *Bulletin*, 1961, v. 58, 685] showed that chlorpromazine did not have a protective effect against experimental infection and intoxication of mice with *Vibrio cholerae*, but, on the other hand, that the drug had an aggravating effect. When the action of chlorpromazine on experimental infections of mice with the EV vaccine strain (an attenuated strain) of the plague bacillus was studied, it was found that the severity of the infection was greatly increased. Cortisone did not appear to have much effect in reducing the severity. That is to say that although cortisone had a slightly inhibitory effect on the action of chlorpromazine it could not be regarded as significant. Cortisone alone greatly increased the virulence of the EV strain in mice and chlorpromazine had no inhibitory effect on this action of cortisone: the death rate in the two comparable groups of mice was approximately the same.

The authors draw attention to the dangers of using cortisone and chlorpromazine in treating human cases of plague. *H. J. Bensted*

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

MUKERJEE, S., RUDRA, B. C. & ROY GUHA, U. K. **Observations on Cholera Endemicity in Calcutta and Survival of *Vibrio cholerae* in the Water Sources.** *Ann. Biochem. & Exper. Med.* Calcutta. 1961, Feb., v. 21, No. 2, 31–40. [16 refs.]

The authors have attempted to relate the survival of cholera vibrios in natural waters from sources in and around Calcutta to prevalent climatic factors and the incidence of the disease in the city. Waters were collected from the river Hoogly, from tanks, from drinking water taps and from sewage water. Each sample was divided into 3 parts: one was left untreated, one was autoclaved and the third was filtered through a Pasteur-Chamberland filter. A standard dose of living vibrios was added to each specimen and daily viability tests were carried out.

In natural waters cholera vibrios survived for short periods only (1–6 days) and there appeared to be no correlation between survival times and atmospheric temperatures, incidence of the disease, and *p*H of the water samples. Neither was there any significant difference in the mean survival times of vibrios in the natural waters from different sources: river water, 2·73 days; tank water was generally more alkaline (*p*H up to 9·4), 3·03 days; drinking water from taps,

3 days. Filtration or autoclaving prolonged the survival times of the vibrios in all the waters and this extended up to 3 weeks. It is presumed that in natural waters there was heavy competition for food from the hardier coliform flora and because of this the more delicate vibrios died off more rapidly; in the treated waters most of the competing coliform and other bacteria were either removed or killed. Nevertheless in sewage water, which would be expected to be much more heavily polluted than the drinking water from taps, the survival times in the untreated samples were not significantly different in the average figures.

In connexion with the many arguments put forward in favour of the theory that cholera vibrios naturally inoculated into water suffer antigen-loss and survive, presumably, over long periods as non-agglutinating (NAG) vibrios, it is of interest to note that the authors found little difference between the survival times of true cholera vibrios and NAG vibrios isolated from water. There was no evidence that natural waters could act as reservoirs of cholera infection for more than a few days. In conformity with the conclusions of other observers [see ABOU-GAREEB, this *Bulletin*, 1960, v. 57, 905], the authors agree that the cholera-infectivity of natural waters depends on their repeated contamination with *Vibrio cholerae* from human sources and not on the long survival of the organism after a single contaminating incident. *H. J. Bensted*

MALLIK, K. C. B. & ROY, J. C. **Coproantibody in Cholera.** *Indian. J. Med. Sci.* 1960, Sept., v. 14, No. 9, 776–9.

Agglutinins for cholera vibrios may be demonstrated with some regularity in the faeces of animals experimentally infected with *Vibrio cholerae* and they also have been reported in the stools of human beings after vaccination against cholera [BURROWS *et al.*, this *Bulletin*, 1948, v. 45, 335].

The authors of the present paper compared the development of agglutinins in cholera patients, in the serum and in the stools, from the day of admission to hospital until the day of discharge—6 to 7 days later. Coproantibodies were found in only half the specimens taken on the day of discharge whereas serum agglutinins were found in 29 out of 33 patients after a similar period. The antibody level was generally lower in the stool than in the serum, but occasionally the levels were the same and in one patient the titre in the stool was one step higher. The highest titre noted in the stool specimens was 1/20. The authors do not consider that coproantibodies in cholera have great importance.

H. J. Bensted

DE, S. N. **Cholera: Its Pathology and Pathogenesis.**

This book was reviewed on p. 1305.

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

SHAFFER, J. G.; IRALU, V. **The Effect of Erythrocytes on the Propagation of *Entamoeba histolytica* in Culture. I. Demonstration of Toxicity of Washed Erythrocytes to a Strain of *E. histolytica*** [SHAFFER & IRALU]. *Amer. J. Trop. Med. & Hyg.* 1961, Jan., v. 10, No. 1, 10–16, 3 figs. [18 refs.] **II. The Effect of Red Blood Cell Derivatives** [IRALU & SHAFFER]. *Ibid.*, 17–21. [18 refs.]

Although it is well known that *Entamoeba histolytica* readily ingests erythrocytes [RBCs] both *in vivo* and *in vitro*, very little is known about the role played by these cells in the nutrition of this amoeba. In these two papers the authors describe experiments designed to elucidate this question by addition of washed rabbit RBCs to cultures of strains of *E. histolytica* grown with *Bacteroides* in McDade and Shaffer's CLG and Shaffer and Frye's media [see this *Bulletin*, 1960, v. 57, 125; 1948, v. 45, 786].

In the first paper it is shown that addition of RBCs to cultures of one strain (K-9) of *E. histolytica* at first inhibited multiplication of the amoebae, and destroyed many of them, but after 5 days they recovered and grew normally in the presence of erythrocytes. Two other strains (103 and 200) resisted the action of the RBCs, which were haemolysed by the amoebae. These experiments thus revealed the presence in erythrocytes of substances toxic to *E. histolytica*.

The second paper is devoted to the study of the nature of the inhibitory action of RBCs on the amoebae. For this purpose, rabbit RBCs were haemolysed, and after centrifugation the stroma was separated from the supernatant fluid, then these preparations were lyophilized and dried, and finally dissolved in saline or water to the desired concentrations, or dialysed. In the experiments, the amoebae were grown in culture in the presence of one or the other of these materials, as well as with haemoglobin, haemin and haematoporphyrin.

It was shown that haemolysed RBCs inhibited strain K-9, their toxic property probably being due to a non-diffusible substance present in the supernatant fluid, as revealed by its dialysis. Haemoglobin and haemin proved to be inhibitory to all the 3 strains used (K-9, 103, 200); therefore it is thought that the haem moiety of haemoglobin is responsible for the toxicity of the erythrocytes. On the other hand, at low concentrations both haemoglobin and haemin, as well as haematoporphyrin, stimulated multiplication of *E. histolytica*. Since all these haemoglobin derivatives had the same effect upon the three strains of this parasite, it is suggested that the resistance of two of them to the action of intact RBCs (noted in the first paper above) might have been due to the ability of the amoebae in question to lyse the erythrocytes, thereby diluting considerably the toxic soluble elements of the erythrocytes. *C. A. Hoare*

SIDDIQUI, W. A. **Demonstration of Antigen-Antibody Reaction with a Monobacterial Culture of *Entamoeba histolytica* in Agar-Gel and on Cellulose Acetate Membrane.** [Research Notes.] *J. Parasitology*. 1961, June, v. 47, No. 3, 371–2, 1 fig.

The present author has sought to demonstrate specific antigen-antibody reactions with *Entamoeba histolytica* grown in culture in presence of *Clostridium welchii*. The antigen was prepared from pooled 48-hour cultures of the parasite, washed six times with physiological saline and broken up in suspension by ultrasonic waves. Antiserum was obtained by immunizing rabbits subcutaneously with the antigen in presence of Freund's adjuvant. When the gel-diffusion method of Ouchterlony was used 3 lines of precipitation were observed. Lines of precipitation also appeared when the cellulose acetate method, followed by staining with nigrosin, was used. These results suggested that *E. histolytica* contains several antigens. *J. D. Fulton*

Magaldi, Cecília, Amato Neto, V. & Meira, J. A. Tratamento da amebíase intestinal pelo sulfato de paromomicina. [**Treatment of Intestinal Amoebiasis with Sulphate of Paromomycin**] *Rev. Inst. Med. Trop. São Paulo*. 1961, Mar.–Apr., v. 3, No. 2, 99–102. [10 refs.]

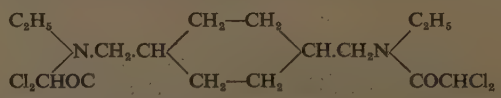
The English summary appended to the paper is as follows:—

"Using the paromomycin sulphate, an antibiotic isolated from *Streptomyces* cultures, the authors treated 20 patients with chronic, mild and asymptomatic intestinal amebiasis. Employing a dosage of 25 mg./kg. of body weight, in 24 hours, for 5 successive days, they obtained parasitologic cure in 95% of the cases, no important side effects having been observed."

Berberian, D. A., Slighter, R. G. & Dennis, E. W. **N,N′-bis(Dichloroacetyl)-Diamines as Amebicidal Agents.** *Amer. J. Trop. Med. & Hyg.* 1961, July, v. 10, No. 4, 503–9.

The present paper describes reports on amoebicidal activity *in vivo* and *in vitro* of 8 new compounds, whose structure is shown, from a series which has previously been investigated for similar activity by the authors [this *Bulletin*, 1954, v. 51, 1064].

The groups include alkylenediamines, xylylene diamines and bis(amino-methyl)cyclohexanes. The relation of structure to activity of these compounds has been discussed [*ibid*., 1961, v. 58, 1014] and the assay procedures which the authors followed were those described [*ibid*., 1950, v. 47, 243]. For *in vivo* tests hamsters harbouring natural amoebic infections and weighing 100–120 gm. were used. Emetine solutions were used as standards in the *in vitro* tests and activity in dilutions as high as 1 in 50 million was noted in the above series and the action appeared to be a direct one, whereas emetine was lethal at 1 in 5000 dilution. Only one compound of marked activity was detected in the hamster tests namely N,N'-bis(dichloroacetyl)-N,N'-diethyl-1,4-bis(amino-methyl)cyclohexane of the following constitution



Another compound of the series proved effective in relieving symptoms in a limited number of human patients.

The authors believe that because of their biological properties this series of compounds would be valuable in treatment and prophylaxis of intestinal amoebiasis in man. *J. D. Fulton*

BEHEYT, P., CHARLES, P. & ROBERTO, S. Le diagnostic biologique de l'amibiase hépatique aiguë. **[The Biological Diagnosis of Acute Hepatic Amoebiasis]** *Ann. Soc. Belge de Méd. Trop.* 1961, Apr. 30, v. 41, No. 2, 93–126. [Numerous refs.]

The existence of amoebic hepatitis without abscess formation has been challenged by various authorities. There is no doubt that in Africa there is a well-defined clinical syndrome of fever, an enlarged tender liver, characteristic haematological abnormalities, and negative exploratory liver puncture, which nevertheless responds in a remarkable way to emetine although antibiotics are ineffective. The term amoebic hepatitis seems inappropriate since liver biopsies show only infiltration with polymorphonuclear cells, and "acute non-suppurative hepatic amoebiasis" is used in this paper to describe the syndrome defined above.

The authors have carried out a series of laboratory investigations in Léopoldville on 75 patients with liver abscess and 104 with acute non-suppurative hepatic amoebiasis fulfilling the criteria already mentioned; 14 were Europeans and the rest Congolese of Bantu origin. The two main objects were to see what laboratory investigations might be of value in the diagnosis of hepatic amoebiasis and whether there were any which would differentiate between amoebic liver abscess and acute non-suppurative hepatic amoebiasis.

Haematological findings were in general the same as those already well-recognized in amoebic liver abscess: polymorphonuclear leucocytosis, moderate anaemia and a marked rise in the erythrocyte sedimentation rate. Normal or near normal findings were not unusual and there was no appreciable difference between the findings in the group diagnosed as amoebic liver abscess and the group of non-suppurative hepatic amoebiasis.

A battery of liver function tests was performed on about half the patients in each group. The thymol turbidity, Takata-Ara and cephalin cholesterol tests all showed abnormal results in both groups, but equally high figures had been reported by other authors when testing unselected Congolese subjects. The alkaline phosphatase and the serum transaminases (SGOT and SGPT) showed abnormal results in about half the subjects of both groups and seemed to offer no diagnostic help. The number of positive results with Closs's chloranilic acid test was too low to be of any value. The serum bilirubin was raised in both groups (mean value about 2 mgm.%). The bromsulphthalein test was abnormal in over 80% and the prothrombin time was reduced in 90% of both groups, but no control series on Congolese is mentioned.

The authors paid special attention to the Weltmann reaction. Abnormal results were found in about 90% of both groups under test but no control series is reported The Weltmann reaction was shown to bear a close correlation with the results of electrophoresis of serum proteins and was considered to be the best simple laboratory test to help in the diagnosis of hepatic amoebiasis in the field.

Estimation of seromucoids showed a marked rise in both groups when compared with a normal series of Africans reported by MICHAUX and SONNET

[this *Bulletin*, 1960, v. 57, 412]. Although the test could not be regarded as specific the authors consider it to be the most helpful laboratory test for the diagnosis of hepatic amoebiasis since the seromucoids are almost always normal or lowered in hepatitis and hepatic cirrhosis, but raised in obstructive jaundice.

In a long discussion of the significance of their laboratory results the authors consider that in tropical areas a shortened Weltmann reaction, an increased titre of seromucoids and a characteristic serum electrophoretic pattern should draw attention to the likelihood of a diagnosis of hepatic amoebiasis, but do not help in the differentiation of liver abscess from acute non-suppurative hepatic amoebiasis which can only be achieved by liver puncture. The close similarity in laboratory findings between the group with liver abscess and those diagnosed as acute non-suppurative hepatic amoebiasis was considered to support the validity of the latter diagnosis. To account for the negative liver biopsy findings in non-suppurative hepatic amoebiasis the theory is put forward that this syndrome may be caused in three different ways: the liver may be in the presuppurative stage when the diagnosis is made and treatment is started before the formation of an abscess; there may be one or more micro-abscesses which are either too small or too deep in the liver to be found on exploratory puncture; and finally there may be cases of "non-specific" reaction of the liver to intestinal amoebiasis.

[In the English summary "*amibiase hépatique aiguë non suppurée*" is translated as "acute non-suppurative amoebic hepatitis" which completely misses the authors' point in specifically avoiding the term hepatitis ("*hépatite*").]

W. P. Stamm

André, M. Fistules biliaires dans les abcès tropicaux du foie (à propos de 3 observations). **[Biliary Fistulae in Tropical Liver Abscess. An Account of Three Cases]** *Bull. Soc. Path. Exot.* 1961, Mar.–Apr., v. 54, No. 2, 207–11.

In one case the abscesses opened in the gall bladder and in the other two the fistula was in the main bile duct. The patients were seen in Fort Lamy, Tchad.

Maiorca, G. & Magaudda-Borzi, L. Reperti istolpatologici da inoculazione di criolisati purificati di *E. histolytica*. **[The Histopathological Picture on Inoculation of Purified Cryolysates of** *Entamoeba histolytica***]** *Riv. di Parassit.* Rome. 1961, June, v. 22, No. 2, 81–8, 6 figs. English summary.

The authors prepared cryolysates from the "Lero" strain of *Entamoeba histolytica* with suspensions containing about 70,000 elements per cc., which they subjected to 3 alternate freezings at –30°C. and thawings at 37°C. They purified these by dialysis for 48 hours in running water and for a similar period in distilled water. They injected 1 cc. of this purified extract into 20 white mice intravenously.

Following a similar technique, they made a purified extract of the "bacterial" flora—*Pseudomonas pyocyanea*, *Escherichia coli* and *Klebsiella aerogenes*—which they found to be growing in association with their *E. histolytica*. They gave an intravenous injection of 1 cc. of this "bacterial" cryolysate to 20 other white mice.

A third batch of 20 mice, as controls, were given 1 cc. of Locke's solution intravenously.

None of the animals died and they were killed after 5, 10, 20 and 30 days. The mice which had received the cryolysate of *E. histolytica* showed lesions of the spleen and, to a lesser extent, of the liver and kidneys. The authors believe that these changes may well represent a tissue reaction to the introduction of a foreign protein rather than be due to a specific toxic action from this cryolysate. Further investigation is obviously needed.

[See also this *Bulletin*, 1960, v. 57, 1067.] *J. Cauchi*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

SERGENT, Ed. & PONCET, Alice. Infection expérimentale à *Borrelia hispanica* du rat blanc. [**Experimental Infection of the White Rat with** *Borrelia hispanica*] *Arch. Inst. Pasteur d'Algérie*. 1961, June, v. 39, No. 2, 109–15, 1 graph.

The "Chiffalo" human strain of *Borrelia hispanica* isolated by André SERGENT *et al.* in 1933 [this *Bulletin*, 1934, v. 31, 87] has retained its virulence through 587 passages in guineapigs for 28 years and virulent strains have been found in the brains of such animals for as long as 3 years [*ibid.*, 1946, v. 43, 560]. The long latent period is accompanied by premunition.

The present authors have studied the behaviour of this strain in white rats, inoculated from an acutely infected guineapig and passaged 60 times in 11 months. In the 122 white rats studied the virulence was much less than that in guineapigs infected with the same strain: this is the reverse of the findings reported by CLASTRIER in 1941 with 2 other Algerian strains [*ibid.*, 1943, v. 40, 460]. In the present studies neither deaths nor true relapses occurred. A graph indicates that in the rats the virulence decreased with successive passages. On the other hand one rat strain, in its 44th passage caused an acute infection on inoculation into 2 guineapigs, one of which died.

8 of the rats were killed at intervals of 9 to 23 months after inoculation and their blood and tissues were inoculated into guineapigs: 6 of the rats still had *Borrelia* in the brain, but not elsewhere, after 9, 10, 11, 14, 15 and 17 months respectively: evidently this strain is neurotropic in the rat, as it is in the guineapig.

Finally, 2 rats were inoculated 9 months after primary inoculation with the blood of other infected rats in their 50th and 51st passages and 2 were similarly inoculated with the blood of guineapigs in their 555th and 556th passages. All the inoculated animals were free of parasites during a period of a month, except one which had been inoculated from an infected rat (50th passage) which showed 1 *Borrelia* per 100 fields, *viz.* a "premunition attack".

Evidently in the white rat, as in the guineapig, this strain has a long metacritical latent period which induces premunition.

H. J. O'D. Burke-Gaffney

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

HANKS, J. H. **Capsules in Electron Micrographs of** *Mycobacterium leprae*. *Internat. J. Leprosy*. Wash. 1961, Jan.–Mar., v. 29, No. 1, 84–7. [12 refs.]

A brief summary of the literature.

DAVISON, A. R. **Acute Edema of Hands and Feet in Leprosy.** *Internat. J. Leprosy*. Wash. 1961, Jan.–Mar., v. 29, No. 1, 29–33, 12 figs.

" Five tuberculoid and three lepromatous cases which developed acute edema and pain of the extremities are described and illustrated. The commonest sites were the hands. Treatment was by prednisone. There are usually no sequelae."

MCLAREN, D. S., SHAW, M. J. & DALLEY, K. R. **Eye Disease in Leprosy Patients. A Study in Central Tanganyika.** *Internat. J. Leprosy*. Wash. 1961, Jan.–Mar., v. 29, No. 1, 20–28, 6 figs. [11 refs.]

The authors made an analysis of the nature and incidence of leprous and non-leprous eye lesions in 1,200 leprosy patients. Approximately 10% had leprous ocular involvement in each of the two leprosaria in central Tanganyika where the study was carried out. The non-leprous lesions were 3 times more frequent at one than the other, the difference being accounted for by the higher prevalence of pterygium and trachoma in the dry, dusty country round about. " It is possible that malnutrition may also play a part, for it is in the latter area that other work has shown a severe deficiency of vitamin A to be responsible for blindness due to keratomalacia in young children " [this *Bulletin*, 1960, v. 57, 1205]. *D. P. Choyce*

DE SOUZA-ARAÚJO, H. C. História da legislação antileprosa da América do Sul no período colonial. [**History of Anti-Leprosy Legislation in South America in the Colonial Period**] *Rev. Brasileira Med.* Rio de Janeiro. 1961, Feb., v. 18, No. 2, 119–26. [13 refs.] English summary.

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (*schistosomes, other flukes*); CESTODES (*Diphyllobothrium, Taenia, Echinococcus, other cestodes*); NEMATODES (*hookworms, Ascaris, filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.*).

HUANG, Wen-Hsien & CHIU, Jui-Kuang. **[Resurvey of the Incidence of Intestinal Helminthic Infections among School Children in a Rural Area in Northern Taiwan]** *J. Formosan Med. Ass.* 1961, Feb. 28, v. 60, No. 2, 216–27. [13 refs.] [In Chinese.] English summary.

This survey in an elementary school in a rice-growing rural area north-west of Taipei was similar in its purpose and methods to that undertaken shortly before among schoolchildren in Taipei city [this *Bulletin*, 1961, v. 58, 594]. Children in this school had been studied previously in 1932 and 1939.

913 of 1,039 pupils were examined and one or more helminths were present in 84·9%. The incidences of *Ascaris*, hookworms, *Trichuris* and *Enterobius* were respectively 65·2%, 33·0%, 68·6% and 40·7%. In 4 children *Paragonimus* and in 1 *Fasciolopsis* were found.

The average mean intensities of the first 3 parasites named above were calculated to represent 37, 4 (*Ancylostoma*, which corresponds to 24 *Necator*) and 11 worms respectively. The infection rates were higher in Taiwanese children, whose parents were farmers, except that of *Enterobius* which was higher in children whose parents were from the mainland.

All rates were strikingly lower than those found in 1932. *Ascaris* had decreased markedly since 1939, presumably because of mass treatment, the incidence of *Trichuris* was unchanged, but that of hookworms had increased significantly, probably because of a great increase in the numbers of vegetable gardens. The findings are set out in 5 tables in the Chinese text.

H. J. O'D. Burke-Gaffney

KAGAN, I. G. & GOODCHILD, C. G. **Paper Electrophoresis of Sera from Man and Experimental Animals infected with Various Helminths.** *J. Parasitology*. 1961, June, v. 47, No. 3, 373–7, 2 figs. [13 refs.]

In this investigation electrophoretic analysis has been applied to the serum of patients with echinococcosis, schistosomiasis and trichiniasis, and also to that of experimental animals with the two last-named diseases. Control sera were kept under the same conditions and analysed on a Spinco paper electrophoresis apparatus, over a period of 20 hours at 23°C. in a veronal buffer at *p*H 8·6. After drying of the paper strips they were fixed in methanol, stained with bromphenol blue and analysed in a recording densitometer, the pattern of the serum proteins being traced on graph paper. Total protein was estimated and also the percentages of albumin, alpha 1, alpha 2, beta and gamma globulins. The patterns of proteins obtained in the above diseases are indicated. The average albumin/globulin ratio changed from 2·1 to about 1·8 or less, owing to lowering of albumin and increase in globulin values. The data obtained indicated that in the different infections the changes in serum proteins were not very characteristic. The changes in gamma globulin and total serum proteins were noteworthy in trichinosis. *J. D. Fulton*

WAGNER, E. D. **Trichlorophenol Piperazine Salt in the Treatment of Intestinal Helminthic Infections in Ethiopia.** *Amer. J. Trop. Med. & Hyg.* 1961, July, v. 10, No. 4, 521–2.

The author, from Loma Linda University, California, describes the use of the crystalline piperazine salt of 2, 4, 5-trichlorophenol in 52 persons suffering from 85 worm infections. Studies in the Research Division of Parke, Davis & Co. had shown its potential value in laboratory animals: the phenolic moiety alone was shown to be a potent anthelmintic and as it comprises four-fifths of the salt molecule it is the dominant therapeutic agent.

The study was carried out in a hospital in Addis Ababa between March and June 1959 and most of the patients were Ethiopian. Pre-treatment and post-treatment stool examinations were made, but no quantitative methods to determine worm burden were undertaken. Three stools were examined in the week after the end of treatment and where possible monthly thereafter.

The drug was given orally as sugar-coated tablets containing 250 mgm., either in a single dose or in divided daily doses for 1 to 5 days. The usual total dose for adults was 6 to 9 gm. given in doses of 1·5 gm. twice daily for 3 days: the dose was reduced for children.

Of 8 patients with hookworm, 23 with *Ascaris* and 14 with *Strongyloides*, 7, 20 and 7 respectively were negative for ova during the follow-up period. These results are tabulated and the dose schedules are shown. In hookworm infections the average total dose was 7·6 gm. and in *Ascaris* infections 5·6 gm. Failures were in patients receiving 3 gm. as a single dose. As there were no side effects a dosage of about 3 gm. daily in divided doses for 3 or 4 days is suggested for the cure of these two infections. 5 of 6 patients with *Enterobius* infection became negative after 1·5 gm. daily for 6 days. It is added that both this infection and that due to *Strongyloides* responded more effectively to pyrvinium pamoate.

Only 6 of 23 patients with *Trichuris* and 2 of 8 with *Hymenolepis nana* were negative after dosages of 3 to 12 gm. It is concluded that the drug was effective against hookworm and *Ascaris* infections. *H. J. O'D. Burke-Gaffney*

DAVIS, A. **Suppressive Management of Schistosomiasis with Antimony Dimercaptosuccinate.** *Ann. Trop. Med. & Parasit.* 1961, July, v. 55, No. 2, 256–61.

It has already been shown that a single dose of TWSb (antimony dimercaptosuccinate) suppresses the excretion of viable *Schistosoma haematobium* eggs for about a month [this *Bulletin*, 1960, v. 57, 48 and 382]. The author has shown that one or two doses reduce the excretion of viable *S. mansoni* eggs for a comparable period.

30 of the African boys attending a school in Kitui district of Kenya, which is a highly endemic *S. haematobium* area, were given 500 mgm. of TWSb (5 ml. of a 10% solution) deeply intramuscularly into the buttocks once a month for 6 months. All initially suffered from haematuria and dysuria, and were passing *S. haematobium* eggs. Their urines were examined on 3 consecutive days before each injection and the numbers of eggs and their viability and infectivity were determined by visual studies and by hatching tests. The data

are set out in tables. The reduction in the number of infective or possibly infective urines over the 6-month period was 60% after the first injection and nearly 90% after the last. The author suggests that 2 or 3 daily doses initially, and then monthly doses over 6 months, would have reduced the number of infective urines to an even greater extent.

The monthly injection programme proved suitable as an out-patient treatment for lightly or for heavily infected patients. It reduces economic loss to the individual and to the community in hyperendemic areas. Side effects were infrequent; 4 boys complained of severe pain on the first injection and one had a swelling (probably this injection was superficial); many limped for a day after each injection; aching joints, vomiting and fever were reported in 2 or 3 cases.

The possible development of drug resistance with this regime is theoretical rather than probable. Liver or kidney damage is a contraindication to this treatment in individual cases; and, as under all antimonial treatment, vigorous physical exercise might cause myocardial damage it should be discontinued. The adoption of this line of attack on schistosomiasis in a community must always be supplemented by a vigorous molluscicidal campaign if it is to produce the effective interruption of transmission of the infection. *A. R. D. Adams*

BARUFFA, G. Sull'impiego di un test all'o-tolidina per la rapida esecuzione dei controlli delle urine nel corso di trattamenti di massa della schistosomiasi vescicale. [**Use of a Test with O-Tolidine for Rapid Screening of Urine during Mass Treatment of Urinary Schistosomiasis**] *Riv. di Parassit.* Rome. 1961, June, v. 22, No. 2, 103–6. English summary (8 lines).

In connexion with trials of mass treatment of urinary schistosomiasis with TWSb in Somalia, the author compared the use of the conventional method of detecting haematuria with an "occult" test in which O-tolidine tablets were used. The methods are described.

In 48 patients under treatment with TWSb, 39 were positive for haematuria by microscopic examination of the centrifuged sediment, but only 21 by the "occult" test. The author therefore concludes that the "occult" test is not wholly reliable for screening of urine during mass treatment of urinary schistosomiasis. *H. J. O'D. Burke-Gaffney*

LEWERT, R. M. & DUSANIC, D. G. **Effects of a Symmetrical Diaminodibenzylalkane on Alkaline Phosphatase of** *Schistosoma mansoni*. *J. Infect. Dis.* 1961, July–Aug., v. 109, No. 1, 85–9, 6 figs.

BARBOSA, F. S., CARNEIRO, Elisabeth & BARBOSA, Ivette. Sur la morphologie de *Planorbarius metidjensis* du Maroc et du Portugal et sa sensibilité à l'infection par *Schistosoma mansoni*. [**Morphology of** *Planorbarius metidjensis* **from Morocco and Portugal and its Susceptibility to Infection with** *Schistosoma mansoni*] *Ann. Parasit. Humaine et Comparée.* 1961, Jan.–Apr., v. 36, Nos. 1/2, 69–75, 4 figs.

See this *Bulletin*, 1960, v. 57, 380.

Ramirez, E. A., Rivera de Sala, Amina, Serrano, Diana & Cancio, Marta.
Electrophoretic Serum Protein Studies in Chronic Human Manson's Schistosomiasis. *Amer. J. Trop. Med. & Hyg.* 1961, July, v. 10, No. 4, 530–36, 3 figs. [16 refs.]

The sera of 67 male patients suffering from chronic *Schistosoma mansoni* infection were studied by paper electrophoresis. Diagnosis was established by demonstration of ova in fresh stools or in the rectal mucosa or in both. 37 healthy adult controls were also studied.

The standard technique for paper electrophoresis as recommended by the manufacturers was used. The values obtained were uncorrected for loss of albumin or protein migration. Data were analysed according to standard statistical formulae corrected when necessary for small samples.

There was a small but significant difference between the control group and the patients: the serum albumin in the patients' sera was lower than that in the control and the gamma globulin higher, though these changes were small as compared with those found in acute infections of experimental animals.

The serum protein changes were studied in their relation to hepatosplenomegaly, the cephalin flocculation and bromsulphthalein tests, the circumoval precipitin test and treatment with antimony. The bromsulphthalein test showed no significant difference in the gamma globulin and albumin levels of patients and controls. Patients with hepatosplenomegaly had a lower albumin and higher gamma globulin than the controls. Patients with hepatosplenomegaly did not differ significantly from patients without hepatosplenomegaly but the difference between patients without it and the controls was questionable. The albumin and globulin mean values of patients without hepatosplenomegaly lay between those of the controls and those of the patients with hepatosplenomegaly, not differing significantly from either but resembling the latter more closely.

Patients showing a positive cephalin-cholesterol test had a lower albumin and a higher gamma-globulin level than those whose sera gave a negative result. There was a slight difference between the negative and the control but it was not significant.

27 patients had been treated with antimony preparations; they were all evidently antimony failures. No significant differences were observed between treated and untreated subjects, thus the serum protein abnormalities in *S. mansoni* infection are not the result of antimony treatment, as has been suggested by some observers.

The circumoval precipitation test was more markedly positive in patients with a significantly high gamma globulin, but no correlation between the circumoval precipitation test and the cephalin-cholesterol test could be established. The latter test is related to the gamma-globulin level in the patients examined and a certain ratio of albumin to globulin must be reached for flocculation to develop. In the majority of patients with a relatively minor degree of raised gamma globulin, to a degree insufficient to produce cholesterol flocculation, the circumoval test is positive This is consistent with the action of an anti-egg precipitin.

The raised gamma globulin in *S. mansoni* infection is due substantially to an antigenic stimulus followed by formation of antibodies, one of which is the circumoval precipitin. *P. A. Clearkin*

PELLEGRINO, J. & DE FREITAS, J. L. P. **Quantitative Complement Fixation Test in Schistosomiasis mansoni.** *Amer. J. Trop. Med. & Hyg.* 1961, July, v. 10, No. 4, 537–40. [18 refs.]

Parasitological methods for diagnosis of schistosomiasis are not entirely dependable when it is desired to determine its prevalence in endemic areas. Detection of ova in faeces becomes more difficult as the disease progresses. Although the intradermal test is relatively simple to perform results in children are less reliable than those in adults.

Results are reported of an investigation in which a complement-fixation technique was used, with an extract of adult schistosomes as antigen. 216 children living in an endemic area [the authors write from Brazil] frequently exposed to infection and 84 adults only occasionally in contact with infection were examined. Infection was confirmed in all cases by examination of faeces. As controls 100 children and an equal number of adults with negative faeces were also examined.

The technique of the test and preparation of the reagents are described in full.

The test group of 300 infected persons gave a positive result to the complement-fixation test in 88·9% of the children and in 89·3% of the adults. The control group all gave negative results. Unlike the intradermal test the complement-fixation test gave essentially the same results with sera from infected children as from infected adults. *P. A. Clearkin*

AIDAROS, S. M. & SOLIMAN, Lily A. M. **Portal Vascular Changes in Human Bilharzial Cirrhosis.** *J. Path. & Bact.* 1961, July, v. 82, No. 1, 19–22, 6 figs. on 2 pls.

Cirrhosis of the liver due to schistosomiasis is common in Egypt. Biopsies were done on the livers of 100 patients (58 under 15 years of age) in Cairo between 1953 and 1955; 95 of these were needle and the other wedge specimens taken during laparotomy. In 86 of the liver specimens there was clear histological evidence of schistosomiasis in the material; in the remaining 14 there was a fibrocellular reaction in the portal tracts in conjunction with the usual laboratory confirmation of the presence of a schistosomal infection in the patient.

Histological lesions were seen in vessels of any size but they were especially common in the smaller vessels. There was partial or complete obstruction of the affected vessels. In the fine vessels schistosomal pseudotubercles were the most frequent lesions and were seen in 30 of the patients; in 18 of these, eggs or their remains were identified within the lesion. The pseudotubercles are in fact occluded vessels with marked endothelial proliferation arranged in concentric layers of swollen cells, or in the form of a syncytial mass with giant cells. Occasionally a central mass of eosinophils—an eosinophil thrombus—can be seen obstructing that part of the lumen of the vessel otherwise patent. Rarely only a worm egg occludes a fine vessel.

In the medium-sized vessels there is marked cellular or fibrous subintimal thickening; this sometimes causes a polyp within the lumen of the vessel, which as a result is narrow and tortuous or obliterated. In large vessels there is cellular proliferation in all coats of the wall; the intima may be thickened and

vascularized, or the lumen of the vessel may be completely occluded. Where dead worms are found in vessels they are surrounded by eosinophils and there is endothelial proliferation and eosinophil invasion of the adjacent vessel wall and contiguous tissue. In 40 patients there was hyaline sclerosis of veins with tortuosity or varicosity of the vessels. Angiomatoids—wide, irregular, thin walled vascular spaces—were seen in 85% of cases; most of these angiomatoids were empty of blood.

The liver lesions of schistosomiasis are primarily due to repeated embolism of eggs over long periods. The fundamental lesions therefore involve intrahepatic branches of the portal veins and essentially are occlusive in nature, so obstructing the portal blood flow. *A. R. D. Adams*

De Sousa e Azevêdo, Eliane E. Biópsia cirúrgica do fígado em portadores de esquistossomose hepato-espleno-intestinal. Dados de microscopia. [**Liver Biopsy in Patients suffering from the Hepato-Splenic-Intestinal Form of *Schistosoma mansoni* Infection**] *Rev. Brasileira Med.* Rio de Janeiro. 1961, Mar., v. 18, No. 3, 175–9, 4 figs. English summary.

The author points out that whatever be the mode of causation, the fact is that in the liver *Schistosoma mansoni* causes a characteristic hepatic fibrosis not seen in any other disease.

Wishing to demonstrate these changes, the author selected 26 patients for liver biopsy from 115 patients in the surgical clinic of the University of Bahia (Brazil) on whom splenectomy was to be performed. They were selected on the following grounds: all had ova of *S. mansoni* in the faeces, portal hypertension, cytopenia, and disturbance of hepatic function. The portal hypertension was shown by splenomegaly, oesophageal varices (proved by X-ray examination or necropsy) or haematemesis. 17 of the 26 had a history of haematemesis or melaena or both.

The results showed that there was constant leucopenia with or without other cytopenias. The liver architecture was conserved in 24. All had increased fibrosis with round cell infiltration; granulomas were found in 18, in 15 of whom there were remnants of ova also. New formation of vessels was present in 25. This is stressed as a distinguishing feature. No regenerative activity of the liver was noted. In 19 patients the spleen weighed over 650 gm. but no relation was found between the intensity of the liver lesions and the spleen weight.

[See also this *Bulletin*, 1961, v. 58, 924.] *W. K. Dunscombe*

Deschiens, R. & Tahiri, M. Dispositif pratique pour l'appréciation colorimétrique dans les eaux douces des doses de chlorure de baryum utilisées en action molluscicide en prophylaxie bilharzienne. [**Apparatus for Colorimetric Estimation of Barium Chloride used in Fresh Water as a Molluscicide in the Prophylaxis of Schistosomiasis**] *Bull. Soc. Path. Exot.* 1961, Mar.–Apr., v. 54, No. 2, 184–9, 2 figs.

[See also this *Bulletin*, 1961, v. 58, 1033 *bis*.]

Le Corroller, Y. & Deschiens, R. Sur l'innocuité des sels de baryum, en action molluscicide antibilharzienne, sur la faune dulçaquicole. [**Lack of Toxicity of Barium Salts for Freshwater Fauna when used as a Molluscicide in the Control of Schistosomiasis**] *Bull. Soc. Path. Exot.* 1961, Mar.–Apr., v. 54, No. 2, 190–93.

Abdalla, A. & Nasr, T. S. **Evaluation of a New Molluscicide, Bayer 73.** *J. Egyptian Med. Ass.* 1961, v. 44, No. 2, 160–70.

Bayer 73 (2-hydroxy-5, 2-dichloro-4 nitro-benzanilide) was issued for test use as a wettable powder containing 70% of the active compound. In laboratory experiments with this product 100% mortality of *Bulinus truncatus* was obtained in 4 hours at 1 p.p.m. concentration, and in 2 hours at 2 p.p.m. The corresponding figures for *Biomphalaria alexandrina alexandrina* were 5 and 3 hours. *Lymnaea cailliaudi* and *Physa acuta* were killed in 5 hours at 1 p.p.m.

In field trials, in static water at 19°C. and *p*H 7·5, all adult snails were killed by 5 hours' exposure to 1 p.p.m., but eggs were not affected. All snails were killed by 8 hours' continuous feeding of 1 p.p.m. into the flowing water of a canal, but again eggs were not affected.

A controlled experiment on the effects of sunlight, *p*H and mud was performed. A solution, originally 1 p.p.m., after 3 hours' standing,

(1) in direct sunlight, *p*H 6·9, was estimated at 0·52 p.p.m.,
(2) in direct sunlight, *p*H 8·3, was estimated at 0·49 p.p.m.,
(3) in diffuse light, *p*H 6·9, was estimated at 0·6 p.p.m.,
(4) in presence of mud [no other conditions stated] was estimated at 0·7 p.p.m.

Bayer 73 was found not to affect germination or growth of a number of important food plants and normal aquatic vegetation. Watercress was an exception. Bayer 73 is unfortunately very toxic to fish even at 0·6 p.p.m., in still or flowing water.

[The authors' conclusion that the presence of mud affects the compound's stability is hardly justified by the above figures.]

[See also this *Bulletin*, 1961, v. 58, 1264.] *B. B. Waddy*

Ritchie, L. W. & Berrios-Duran, L. A. **A Simple Procedure for recovering Schistosome Eggs in Mass from Tissues.** *J. Parasitology.* 1961, June, v. 47, No. 3, 363–5, 1 fig.

Livers or intestines from heavily infected mice or hamsters are taken at 7 weeks after infection and 3 of them at a time are homogenized by Waring blendor with 500 ml. of 1·7% sodium chloride with a few drops of Triton. The homogenate is sieved and transferred to a side-arm Erlenmeyer flask. A 2% salt solution is then run slowly and smoothly into the bottom of this flask through a tube fitted to an aeration stone, so that a sharp layering develops between the homogenate and the 2% saline. The eggs sediment through this interface into the clear solution. The flow is continued until all the homogenate has run off through the side-arm; it is then discarded. After sedimentation, the upper parts of the fluid in the flask are removed by suction. The lower parts can then be transferred to a smaller flask for further sedimentation, and so on. If the eggs are to be lyophilized, they are transferred to distilled water which is cooled to 4°C. to prevent hatching. *F. Hawking*

RADKE, M. G., BERRIOS-DURAN, L. A. & MORAN, K. **A Perfusion-Procedure (Perf-O-Suction) for recovery of Schistosome Worms.** *J. Parasitology*. 1961, June, v. 47, No. 3, 366–8, 2 figs.

In this method, isotonic saline is delivered under pressure from an automatic pipetting machine with foot switch. Chloroformed mice or hamsters are clamped out on special plastic autopsy boards and the abdominal cavity is cut widely open. A hypodermic needle (23 gauge) is inserted into the thoracic aorta, through which saline is forced from the pipetting machine in suitable amounts. The hepatic portal vein is cut, and the saline, blood, and worms escape from it into depressions in the plastic autopsy board. From there, the fluid and contained worms are collected by a suction apparatus into a large separating funnel.

It is claimed that this technique is simple and rapid and that it collects 98% of the worms in mice, or 84% of those in hamsters. For further details of the method the original paper should be consulted. *F. Hawking*

KOMIYA, Y. **The Ecology of** *Oncomelania nosophora*: **a Review.** *Japanese J. Med. Sci. & Biol.* 1961, Feb., v. 14, No. 1, 1–9. [Numerous refs.]

SHORT, R. B. & HOLLIMAN, R. B. *Austrobilharzia penneri*, **a New Schistosome from Marine Snails.** *J. Parasitology*. 1961, June, v. 47, No. 3, 447–52, 13 figs. on 2 pls.

The cercaria was obtained from a snail at Shell Point, Florida. It was shown to produce dermatitis.

KAMO, H., NISHIDA, H., HATSUSHIKA, R. & TOMIMURA, T. **On the Occurrence of a New Lung Fluke,** *Paragonimus miyazakii* **n. sp. in Japan (Trematoda: Troglotrematidae).** *Yonago Acta Med.* 1961, Mar., v. 5, No. 1, 43–52, 31 figs. (29 on 4 pls.). [21 refs.]

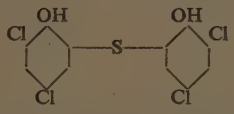
"On the basis of the specimens experimentally parasitized in the cat, a new species of lung fluke, *Paragonimus miyazakii* n. sp. was described first in this paper."

YOKOGAWA, M.; YOSHIMURA, H.; SANO, M.; OKURA, T.; TSUJI, M.; TAKIZAWA, A.; HARADA, Y.; KIHATA, M.; IWASAKI, M.; HIROSE, H. **Chemotherapy of Paragonimiasis with Bithionol. I. Experimental Chemotherapy on the Animals infected with** *Paragonimus westermani* **or** *P. ohirai* [YOKOGAWA, YOSHIMURA, SANO, OKURA, TSUJI, TAKIZAWA, HARADA & KIHATA]. *Japanese J. Parasit.* 1961, Apr., v. 10, No. 2, 302–16, 12 figs. [15 refs.] **II. Clinical Observations on the Treatment with Bithionol** [YOKOGAWA, YOSHIMURA, OKURA, SANO, TSUJI, IWASAKI & HIROSE]. *Ibid.*, 317–27, 1 fig. [19 refs.]

I. According to a review, emetine plus sulphonamide, and chloroquine are at present used in Japan for the treatment of human paragonimiasis but the results are only moderately satisfactory.

A screening technique was developed by YOKOGAWA *et al.* (*Japanese J. Parasit.*, 1956, v. 5, 55) using excysted metacercariae of *Paragonimus westermani in vitro*. According to this technique, emetine, mepacrine and chloroquine were effective in 24 hours at 1 in 200,000—400,000 and a new compound Bithionol was active at 1 in 1·4 million. Dogs or cats infected with *P. westermani* have previously been used as experimental animals but they are cumbersome, and the present authors used rats infected with *P. ohirai*.

Bithionol (Actamer, Bitin) is 2,2′-thiobis(4,6-dichlorophenol):



It is a tasteless white powder, poorly soluble in water, which has previously been used in cosmetics, and as a drug for chicken tapeworm and cattle liver fluke. When given to mice and rats orally daily for 5–8 times, 70 mgm./kgm. was tolerated without lesions; 150 and 300 mgm./kgm. caused ascites and moderate degeneration of the liver. In the therapeutic experiments 4 dogs were experimentally infected and treated for various periods from 79–318 days after infection. The dose was 100–150 mgm./kgm. every second and third day for 7–35 doses. The live worms recovered from the lungs formed 11–60% of the metacercariae initially given (the usual ratio in untreated dogs is 68–74%). During treatment, the number of eggs excreted in the faeces diminished to a low figure but it rose again when treatment ceased. At autopsy various proportions (in the different dogs) of worms were found to be dead or degenerate. During treatment the dogs suffered from transient diarrhoea and anorexia, but there was no loss of weight.

In the rats infected with *P. ohirai* the rate of survival of worms, compared with metacercariae given, was 67% in untreated rats, and 20% and 11% respectively in rats treated with Bithionol at 50 mgm./kgm. and 100 mgm./kgm. respectively by mouth every other day for 4–6 doses, the treatment being given when worms were mature. If the treatment was given at the time of infection or while the worms were immature, it was somewhat less effective. In worms removed from animals soon after treatment, the genital organs (ovary and uterus) were degenerate but 10 days after treatment they recovered. Apparently this compound is more effective than emetine or chloroquine, even though it does not kill all the worms in dogs and rats.

[This is a valuable paper which should be consulted in the original by those interested.]

II. In preliminary experiments Bithionol was given to human subjects by mouth in single doses. With 30 mgm./kgm. there were no side effects; with 50 mgm./kgm. diarrhoea; with 150 mgm./kgm. abdominal pain and frequent diarrhoea which soon subsided. Accordingly the dose chosen was 50 mgm./kgm. per day in 3 subdivisions every other day, for 10–15 times. After 3 such subdivisions the blood concentration was 120–140 μgm. which subsided to 83 or 97 μgm./ml. in 24 hours. During a second course of 3 subdivisions the blood concentration reached 133–154 μgm./ml.

13 patients with *P. westermani* were then treated as above, 1 patient for 5 day-units, 4 for 10 day-units and 8 for 15 day-units. The patients ranged in age from 8 to 38 years and most of them had shown symptoms for about 4 years;

it is possible that most of them had light infections harbouring few worms. The results were judged by the production of eggs in faeces and in sputum. In all cases, the stools and sputum became free from eggs after 2–5 days' treatment, and they remained negative during the next 6 months. The side effects, which were mild and transient, included diarrhoea (9 cases), abdominal pain (5), nausea (3), vomiting (2), urticaria (2). The blood counts and urine and liver function remained normal.

It is considered that this drug constitutes an effective and safe remedy for paragonimiasis.

[If these results are confirmed, they are very important.] *F. Hawking*

RENDTORFF, R. C. **Additional Records of Human Cases of *Dipylidium caninum* Infections.** [Research Notes.] *J. Parasitology*. 1961, Aug., v. 47, No. 4, Sect. 1, 538.

Only 14 cases of *Dipylidium caninum* infection in man appear to have been recorded in the United States [this *Bulletin*, 1961, v. 58, 605].

The present author, from the College of Medicine, University of Tennessee, reports 3 additional cases seen by him in children in Memphis. In 2, no further record was available, but in the third, a white girl aged 5 years, there was a history of frequent fondling of a pet cat. "Exactly the same kind of worms" had been seen crawling over the cat's faeces, but the cat had been treated before its faeces were examined and no parasites were found. Dogs also occasionally visited the child's home, but the author thinks that the cat was probably the reservoir. The child was apparently cured with mepacrine. Current interest in this infection will probably increase the records in the United States.

H. J. O'D. Burke-Gaffney

DIXON, H. B. F. & LIPSCOMB, F. M. **Cysticercosis: An Analysis and Follow-up of 450 Cases.**

This book was reviewed on p. 1198.

FAIGUENBAUM, J. Aspectos epidemiológicos de la cisticercosis en Chile. [**Epidemiological Aspects of Cysticercosis in Chile**] *Bol. Chileno de Parasit.* 1961, July–Sept., v. 16, No. 3, 71–5. English summary.

Between 1959 and 1960 some 190,000 pigs were slaughtered in 23 abattoirs in Chile and 15% were found to have cysticercosis. In the department of parasitology some 190 out-patients are seen annually with this disease, most of them uffering from *Taenia saginata* infection. In 1960, only 15 of 201 cases were due to *T. solium*, and in the first 4 months of 1961 only 8 of 62. Most of the patients harbouring *T. solium* came from rural areas.

Of 145 patients with cysticercosis seen in the neurosurgical institute, 66.2% were from rural areas. Also 77·7% of these patients were between 20 and 50 years of age and only 6 were under 10 years old.

The 3 important factors in dissemination and maintenance of endemicity of

cysticercosis in Chile are (1) inadequate disposal of excreta, (2) unhygienic pig-breeding and unhygienic habits of many of the workers and (3) insufficient meat inspection: only half of the abattoirs have adequate veterinary control.

The author discusses preventive measures, personal and communal, and outlines measures which are along the usual lines. Appropriate legislation exists, but not all comply with it. Education in hygienic measures is of paramount importance. *H. J. O'D. Burke-Gaffney*

Vosta, J., Kolár, J., Klouda, M. & Petru, M. Naše zkušenosti s moderními anthelmintiky. III. sdělení. Léčba invaze tasemnicí *Hymenolepis nana* "Cestodinem" a srovnání s účinností Acranilu. [**Treatment of Invasion with Tapeworm *Hymenolepis nana* by Cestodin as compared with the Effectiveness of Acranil.** *Časopis Lékařů Českých*. Prague. 1961, Sept. 15, v. 100, No. 37, 1169–71. [16 refs.]

The English summary appended to the paper is as follows:—

"From a total of 40 children infested with Hymenolepis nana 29 children, i.e. 72·5 per cent were cured with Cestodin. As compared with Acranil which cured 8 out of 15 children, i.e. 60 per cent, Cestodin has the advantage of a higher effectiveness and better tolerance. It is therefore particularly suited for the treatment of Hymenolepis nana in child communities."

[See this *Bulletin*, 1959, v. 56, 1042.]

Lukashenko, N. P. & Zorikhina, V. I. [**Epidemiology of Alveolar Echinococcosis in Central Districts of the Barabinsk Forest-Steppe Region of the Novosibirsk Oblast**] *Med. Parasit. & Parasitic Dis.* Moscow. 1961, v. 30, No. 2, 159–68, 2 figs. [20 refs.] [In Russian.]

In a field investigation of the epidemiology of alveolar echinococcosis carried out in the Novosibirsk oblast in 1958 autopsies were carried out on 3,510 wild and domestic mammals belonging to 31 species, and 649 inhabitants of the area were examined by means of the Casoni skin test. Among 259 carnivores studied, *Echinococcus multilocularis* was found in 89 of 162 (54·9%) foxes, 1 of 2 wolves and 1 of 20 dogs. Among 3,249 rodents and insectivores belonging to 22 species *E. multilocularis* was found in 50 of 1,188 (4·2%) voles. The skin test was positive in 15 persons (2·3%). *D. J. Bauer*

Bregadze, I. L. & Semenov, V. S. [**Nosogeography of the Alveolar Form of Echinococcosis in Siberia**] *Med. Parasit. & Parasitic Dis.* Moscow. 1961, v. 30, No. 2, 168–72. [27 refs.] [In Russian.]

The authors have investigated the distribution and frequency of alveolar echinococcosis in Siberia by means of a questionary sent to surgeons in large towns between Omsk and Vladivostok, the results of which are presented in a table. 56 cases were observed in 1957–59 in the Altai region, 120 in 1953–59 in the Novosibirsk oblast, 259 in 1937–59 in the Yakut A.S.S.R., 98 in the Krasnoyarsk region in 1942–57, and 100 cases over 40 years in the Tomsk oblast. *D. J. Bauer*

PARODI, E. Il test di emoagglutinazione condizionata nella diagnostica sierologica della echinococcosi. [**The Conditioned Haemagglutination Test in the Serological Diagnosis of Echinococcosis**] *Giorn. di Igiene e Med. Preventiva.* Genoa. 1960, July–Dec., v. 1, Nos. 3/4, 200–206. [22 refs.] English summary (7 lines).

The author points out that although the Casoni intradermal test is the most used at the present time for the diagnosis of a hydatid infection it is not absolutely specific, while the complement-fixation test is not specific and lacks sensitivity. In view therefore of the general usefulness of the agglutination test with tanned red cells he tried this in a series of tests using antigens made from (a) a lyophilized aqueous extract of hydatid membrane, (b) liquid from the cysts filtered through a Jena G5 bacteriological filter. Sera were diluted for the tests with either buffered solution or human serum diluted 1 in 100. In addition a complement-fixation test and the Casoni test were performed on 9 patients.

Sera were tested from rabbits artificially immunized by injections of cyst fluid, from 9 patients with known hydatid infections, from normal rabbits, and from patients suffering from various other diseases, 3 of which were due to helminths.

The results were much better with the human sera from antigen (a) which may have been due to its higher protein content, but the haemagglutination test gave more positives than the CF test which gave 4 negatives in the 9 patients with hydatids, in all of whom the Casoni test was positive. All the patients with other diseases were negative and were also negative to the Casoni test. The necessity of using formolized tanned red cells is stressed but the author considers that with antigen (a) the test is very sensitive and specific.

W. K. Dunscombe

MUTOLO, P. Cisti da echinococco del polmone ignorate diagnosticate attraverso l'indagine schermografica nella provincia di Reggio Emilia e loro esito. [**Unsuspected Echinococcus Cysts in the Lung diagnosed during an X-ray Survey in the Province of Reggio Emilia, and their Result**] *Boll. Schermografico.* Rome. 1960, Sept.–Oct., v. 13, No. 5, 169–91, 18 figs. [24 refs.] English summary (8 lines).

The author reports on the finding of echinococcus cysts in the chests of 18 patients who had had little or no indication of any illness. The survey was carried out by a mobile X-ray unit during the years 1952–58. 13 of the patients were shepherds or other peasants from the mountain districts of the province, where about one-eighth of the population lives and where echinococcosis is endemic. In age, 6 were between 5 and 10, 2 were 11–15, 1 was aged 30, 3 were 40–50 and 6 were 51–61. 11 were women.

One patient had cysts on both sides of the chest, 4 had them in the left lung and the other 13 on the right side. The Casoni test was positive in 14 but the other 4 were confirmed by surgical operation. When this paper was written, 12 had submitted to operation, which was followed by full recovery in 11; the remaining patient had a very large cyst in the upper right lobe, the complete removal of which was found not to be possible. One patient in the series died

from suffocation due to rupture of the cysts. At the time of writing, 2 other patients had just entered hospital to undergo operation and the remaining 3 —all women—still refused surgical treatment. Details of the patients are given and 18 skiagrams are reproduced. *J. Cauchi*

LAYRISSE, M., PAZ, A., BLUMENFELD, Norma & ROCHE, M., with the technical assistance of Iris DUGARTE & Adelina OJEDA. **Hookworm Anemia: Iron Metabolism and Erythrokinetics.** *Blood.* 1961, July, v. 18, No. 1, 61–72, 1 fig. [23 refs.]

11 patients in Caracas with heavy hookworm infection were studied, and the results concerning blood loss and replacement were essentially the same as those of FOY and KONDI [this *Bulletin*, 1961, v. 58, 233]. Worm counts were not made, but on the average the blood loss was 2·4 ml. per day for each 1,000 ova per gm. of faeces; however the data show that the variation by this method of assessment was considerable.

A model is presented of the course of a new infection of a normal person by 1,285 *Necator*, leading to a blood loss of 45 ml. a day. After about 100 days the iron stores would be exhausted and the Hb level would begin to fall. The iron loss would become progressively less as the Hb level fell, and 500 days or longer after infection it would be counterbalanced by the iron absorbed from the food of an ordinary person in Venezuela; a steady state would then be reached. Conversely, a light infection (under 5,000 ova per gm. faeces per day) would cause the loss of only 4 mgm. of iron per day, an amount easily replaced in the absence of growth, menstruation, or pregnancy. [See also *ibid.*, 1959, v. 56, 1163.] *Alan B. Raper*

ROCHE, M., PÉREZ-GIMÉNEZ, Maria E. & LAYRISSE, M. Survie des érythrocytes circulants dans l'ankylostomose humaine. **[Survival of Circulating Erythrocytes in Ankylostomiasis]** *Rev. d'Hématologie.* 1960, Jan.–Mar., v. 15, No. 1, 19–24, 1 fig. [19 refs.]

The authors have already made several studies with radio-active chromium on blood loss in ankylostomiasis [see, for example, this *Bulletin*, 1957, v. 54, 1336].

In this study they have investigated red-cell survival by means of ^{51}Cr in 12 persons without ankylostomiasis, 6 with light infections and 12 with heavy infections (more than 900,000 ova in the faeces daily). The results are tabulated, together with haemoglobin levels and haematocrit readings in control subjects. In patients with ankylostomiasis, because of intestinal blood loss, correction has to be made for loss of chromium in the faeces. The calculations used are set out and this is allowed for in the results.

In the normal subjects the average red-cell survival was 26 days, which is within normal limits. In light infections with hookworms, it was about the same, but in heavy infections it was reduced to 17 days: however, when the necessary correction was made this figure became 27 and in all but 2 cases it was within normal limits. It would seem therefore that a haemolytic factor was not present in the parasites which would contribute to the anaemia.

H. J. O'D. Burke-Gaffney

Kono, M. & Sawada, T. **[Studies on Hookworm Immunity. I. Precipitin Test]** *Japanese J. Parasit.* 1961, June, v. 10, No. 3, 415–18, 4 charts. [In Japanese.]

The English summary appended to the paper is as follows:—

"Studies on hookworm (*Ancylostoma caninum*) immunity using precipitin test were carried out.

"Rabbits were immunized with following antigens: 1) living larvae, 2) homogenate of larvae, and 3) homogenate of adult worms.

"Experimental results obtained were as follows:

"Precipitin tests on antisera of rabbits immunized with living larvae showed marked higher titer (12,800 to 3,200 fold) with larval antigen than with adult antigen (3,200 fold or lower) and most antisera of rabbits immunized with homogenate of larvae showed also the same result.

"On the other hand antisera of rabbits immunized with homogenate of adult worms showed a higher titer (1,800 to 3,200 fold) with adult antigen than with larval antigen (3,200 to 400 fold positive)."

Ferriolli, F., Jr. Condições que influem na extração de larvas do *Strongyloides stercoralis* das fezes pelo método de Looss-Baermann modificado (técnica do pires). **[Conditions influencing the Extraction of *Strongyloides stercoralis* Larvae from Stools by a Modified Looss-Baermann Technique]** *Rev. Inst. Med. Trop. São Paulo.* 1961, Mar.–Apr., v. 3, No. 2, 51–60. [17 refs.] English summary.

The author writes from the medical parasitology department of the University of São Paulo, Brazil. The modification referred to is the "dish technique" which he has already described [this *Bulletin*, 1961, v. 58, 1153]. He reviews at some length the literature regarding the factors which influence the extraction of *Strongyloides* larvae from stools and describes very detailed experiments made by himself in this connexion.

The principal findings were as follows. The number of larvae was reduced if the stools were kept at room temperature (about 25°C.) for 18 hours, and was reduced still more if they were kept in the refrigerator (1–5°C.): in fact in this last case several previously positive stools became negative. It is clear that recently passed stools should be used.

When the amount of faeces extracted was too small, lightly infected specimens gave negative results. Not less than 10 gm. should be used.

When the extraction was carried out for 60 minutes, 97·8% of known positive specimens yielded larvae: when the time was extended to 120 minutes, larvae were recovered from 100% of known positive specimens. The water in which the extraction was made was kept at various temperatures. It was shown that the initial temperature of 45°C. should not be allowed to fall below 40°C., or otherwise the number of larvae extracted may become reduced.

Artificial light did not improve extraction and, indeed, intense illumination resulted in several specimens becoming negative. *H. J. O'D. Burke-Gaffney*

GUIMARÃES, J. X., FERRAZ, W. P. G., ADURA, M., VILLELA, M. de P., PUCCI, H., SOARES, M. A., LOPES, E. R., GALANTE, A. & NEWTESNEK, B. O emprêgo do iodeto de ditiazanina na estrongiloidose. Observação clinica de 92 casos. **[Trials of Dithiazanine in Strongyloidiasis]** *Rev. Paulista Med.* 1961, June, v. 58, No. 6, 389–94. [19 refs.] English summary.

The authors, in São Paulo, Brazil, used dithiazanine in the treatment of 92 patients with *Strongyloides* infection. The usual dose for adults was 300–400 mgm. daily for 14 to 15 days to a total of 4·5 to 5·2 gm. Side effects occurred in 39 patients and 4 were obliged to abandon treatment. Of the remaining 88 patients, 83 were cured as judged by examination of faeces by the Baermann technique.

[See also this *Bulletin*, 1961, v. 58, 820.] *H. J. O'D. Burke-Gaffney*

LÝSEK, H. Přispěvek k otázce patogenity škrkavky praseči pro člověka. **[Contribution to the Problem of Pathogenicity of *Ascaris suum* in Man]** *Československ. Epidemiol., Mikrobiol., Imunol.* Prague. 1961, v. 10, No. 2, 134–6. [11 refs.] English summary.

The English summary appended to the paper is as follows:—

"1. The author carried out on himself twice an experimental infection with pathogenic eggs of Ascarides acquired from pigs. In the first case the ascariasis reached according to the subjective symptoms the pulmonary stage, i.e. the stage when the larvae invade the lungs. In the second case the ascariasis reached the stage of the sexual maturity of the helminths in the intestine. Fertilized and unfertilized eggs of Ascarides were found in the faeces.

"2. With regard to the results of his experiments and with respect to the notorious morphological and anatomical uniformity and the outstanding immunologic conformity of the two species the author considers *Ascaris lumbricoides* and the *Ascaris suum* to be one and the same species, viz. *Ascaris lumbricoides Linné 1782.*

"3. The author does not think it right to divide this species in two subspecies or varieties, viz. *Ascaris lumbricoides hominis* a parasite in man and *Ascaris lumbricoides suis* — a parasite in pigs. This classification is based on a non-existing specificity of the hosts and is thus without any justification."

SNYDER, C. H. **Visceral Larva Migrans. Ten Years' Experience.** *Pediatrics.* Springfield, Ill. 1961, July, v. 28, No. 1, 85–91, 2 figs. [19 refs.]

This paper is based upon an experience spread over 10 years. At present at the Ochsner Clinic, New Orleans, the author has had access to records of 20 children in whom the diagnosis of visceral larva migrans has been made. In one half of them it was proved by liver biopsy. The remainder were judged to be suffering from this syndrome because they satisfied the criteria of hyper-eosinophilia (over 30%) and because they ate dirt and had no other detectable cause for eosinophilia.

From analysis of the collected data, which are tabulated, it becomes clear that in New Orleans, at any rate, this is a disease of small children. The average age

was 2 years and the majority (75%) were boys and all gave a history of pica 55% had fever, recurrent and mild, though in some, temperatures as high as 104°F. were recorded. Pallor was noted in 40% and coughing or wheezing in half that number; other symptoms were lassitude, anorexia and loss of weight.

Hepatomegaly was noted in 85%, usually moderate, in some cases extreme and reaching well below the umbilicus. Splenomegaly was also frequent in 45%, but never of any marked degree.

Erythrocyte counts revealed some anaemia in most: haemoglobin concentrations varied from 5·8 to 14 gm. per 100 ml., with less than 11 gm. per 100 ml. in 80%.

Leucocytosis was a prominent feature in all but the mildest case. One patient had 120,000 leucocytes per cmm., and nearly half had over 40,000.

An eosinophilia of over 30% was considered essential for the diagnosis and was over 50% in most and 90% in one patient.

Hyperglobulinaemia was a feature in the most severe cases. 5 out of 8 in whom the protein concentration in the serum was measured were found to have increased globulin levels.

Pulmonary involvement was common, even though only 4 patients manifested pulmonary symptoms. Roentgenograms showed pulmonary infiltration in 7 out of 17 (42%). These findings are probably due to the migration of larvae through the lungs.

There were no deaths. Recovery was complete in all but one patient who became blind in one eye. Cutaneous involvement was seen in 2 cases (as previously reported by Dent and Carrera, *J. Louisiana Med. Soc.*, 1953, v. 105, 275). In one it took the form of painful haemorrhagic and necrotic lesions on the buttocks and thigh; in the other a generalized macular eruption. Ocular involvement was a serious complication in a boy of 23 months who when first seen presented the classic sequence of pica followed by anorexia, fever and the development of hepatomegaly and hypereosinophilia. Four years later he returned with visual disturbance in the left eye in which a parasitic granuloma was diagnosed.

In diagnosis, short of biopsy, reliable clinical tests are lacking. Precipitin tests, with a *Toxocara* antigen, may give positive results. At present, serological tests are helpful [this *Bulletin*, 1960, v. 57, 1194] but not conclusive, as a positive serological reaction could result from previous asymptomatic infection.

The question of therapy remains unsettled. It was difficult to assess the value of diethylcarbamazine, since most of the children received supportive treatment as well as the antiparasitic drug and all were cautioned against dirt eating. Piperazine citrate seems to have no demonstrable effect [*ibid.*, 1961, v. 58, 100].

Corticosteroids are probably warranted in very severely affected patients, particularly those with extensive pneumonitis where anti-inflammatory effects may prove them life-saving. *Philip Manson-Bahr*

Molina Pasquel, C. Larva migrans visceral. **[Visceral Larva Migrans]** *Salud Pública México.* 1961, Mar.–Apr., v. 3, No. 2, 251–5. [20 refs.]

The author is chief of the tropical medicine clinic of the Mexican Institute of Hygiene and Tropical Diseases. He reviews the literature on tropical eosinophilia and visceral larva migrans and describes 2 cases seen in the Institute.

The first patient, aged 8 years, had previously passed several *Ascaris*. She was in a poor condition, anaemic, had an enlarged liver and abnormal liver function tests. The stools contained many *Trichuris* eggs and also *Entamoeba histolytica* cysts. Polyadenitis was present and biopsy of a cervical gland revealed lymphoid hyperplasia and considerable eosinophil infiltration. The leucocytes reached 28,000 per cmm. and the blood eosinophilia 50%. Despite successful treatment of the intestinal parasites and general improvement, the eosinophilic leucocytosis, hepatomegaly and abnormal liver function tests persisted. Liver biopsy showed fragments of larvae of *Toxocara canis*.

The second child aged 2 years had several bouts of fever, which responded temporarily to antibiotics. When finally seen she had an enlarged liver, 22,300 leucocytes per cmm. and an eosinophilia which fluctuated over 2 months between 23% and 69%. The only other abnormal laboratory finding was a positive thymol turbidity test. Liver biopsy could not be obtained.

In both patients, the condition responded to diethylcarbamazine (together with Carbarsone in the first patient). In the second patient there was a transient increase in eosinophil leucocytosis in the first 48 hours after treatment had begun, but this fell within a week to pre-treatment levels. Diagnosis in this case was based on response to treatment. Both children had had contact with dogs.

H. J. O'D. Burke-Gaffney

BOURKE, G. M. & YEATES, F. M. **Blindness due to Household Pets** (*Toxocara canis* **Infestation**). *Med. J. Australia.* 1961, July 1, v. 2, No. 1, 12–14, 2 coloured figs. on pl.

A case is reported of nematode endophthalmitis in a boy aged 5 years in which blindness was due to a cyclitic membrane and detachment of the retina. Four years earlier the child had suffered from recurrent fever, anaemia and enlargement of the liver. At that time the ocular fundi were normal, but as the clinical findings suggested infection with *T. canis*, a laparotomy was performed; the liver was studded with minute granulomatous lesions.

The literature is reviewed and the life history of *T. canis* is described. The conclusion is drawn that the egg containing the larva is the aetiological agent of the disease visceral larva migrans. The eggs are ingested by children after handling an infected suckling bitch or the puppies between the ages of 3 weeks and 6 months. The authors suggest that *T. canis* infection in children is more common than is realized and wonder whether, in urban communities, the dog is really man's best friend.

A. McKie Reid

WORLD HEALTH ORGANIZATION. PUB. HEALTH PAPERS No. 10. **Control of Soil-Transmitted Helminths** [BEAVER, P. C.]. 44 pp. [Numerous refs.] 1961. Geneva: Palais des Nations. [Sales agent for U.K., H.M. Stationery Office.] [3s. 6d.; $0.60; Sw.fr. 2.–.]

Considerable progress has been made in the control of the helminth parasites of man which have intermediate hosts. In contrast, control efforts against *Ascaris lumbricoides*, *Trichuris trichiura*, *Ancylostoma duodenale*, and *Necator americanus*, the eggs of which mature in the soil, have had disappointing direct results. Despite the vast literature on the soil-transmitted helminths,

there are important gaps in the known epidemiological facts. Generally, roundworm, whipworm and hookworm infections are common throughout the tropics and subtropics, and elsewhere where conditions are suitable. Infection does not necessarily imply disease, for a light load of worms causes no symptoms. In this respect contradictions appear, for anaemia has been reported in persons with light hookworm loads, and *Ascaris* in small numbers are said to have toxic or allergic effects on some persons. However, though the total eradication of these helminths is at present an unattainable ideal, there are sound reasons for advocating campaigns to reduce the average load carried. A control programme should aim at developing natural barriers to transmission and abating the retarding effects of disease, nutritional as well as environmental.

Only for *Ascaris* is a really satisfactory anthelmintic, piperazine, available for mass use. On the other hand, *Ascaris* and *Trichuris* ova have a longer survival potential outside the human body than those of the hookworms, and if indiscriminate defaecation by children continues to occur, ascariasis can flourish even in the presence of water sanitation. Chemical soil disinfectants, used round houses, might have some preventive value in such a situation. The provision of shoes has not been successful in preventing ankylostomiasis, perhaps because it is in the very places where infection mostly occurs that the wearers remove them to keep them clean. The manuring of farms with night soil cannot be prevented; nor can efficient composting beforehand, to kill ova, be ensured.

An ecological approach to control is advisable. The essential environmental factors for transmission of each species are numerous and complex, and it is possible to define conditions unfavourable to them. The greater part of transmission occurs in the immediate vicinity of the family home, and though families aggregate in villages etc., the family and its helminths should be regarded as the ecological unit.

The author advocates the use of the direct smear as a technique for egg-counts, rather than more complicated techniques. *B. B. Waddy*

ROUSSEAU, C., KERNÉIS, J. P. & BRUNEAU, Y. Épididymite d'origine filarienne révélée dix ans après l'infestation. [**Epididymitis of Filarial Origin Appearing 10 Years after Infection**] *Bull. Soc. Path. Exot.* 1961, Mar.–Apr., v. 54, No. 2, 181–4, 2 figs. on 2 pls. [15 refs.]

The English summary appended to the paper is as follows:—

"The authors report a case of epididymitis due to filariasis [*W. bancrofti*]. The interest of this observation lies in the fact that this localization appeared ten years after the patient had left the endemic area [Indochina]."

BUCKLEY, J. J. C. & WHARTON, R. H. **Anomalous Results from an Experimental Infection of Man with *Brugia malayi* (Brug, 1927).** *J. Helminthology.* 1961, Suppl., 17–24, 2 figs.

Previous attempts [this *Bulletin*, 1958, v. 55, 1356] by the senior author to infect a volunteer with *Brugia malayi* from *Macaca irus* and also with *B. pahangi*, derived from a domestic cat, failed to produce a mature infection,

but resulted in all the clinical and pathological manifestations of pulmonary eosinophilia, thus supporting the theory expounded first by DANARAJ alone [*ibid.*, 1957, v. 54, 490], and later in association with other colleagues [*ibid.*, 1341], that this phenomenon may really be caused by exposure to infection with non-human parasites for which man is an unsuitable host and in whom full development cannot be completed. This statement rests upon the strong filarial complement-fixation test and the favourable response to diethylcarbamazine seen in patients in Singapore. A point was also made that in human patients infected with *Wuchereria bancrofti* and *B. malayi*, the eosinophils were moderately increased in comparison, and in only a small proportion did the complement-fixation test become positive and then only in relatively low titres.

The present experiment was devised in order to compare the effect of an infection with a genuine filarial parasite of man with the effects previously observed with a non-human filarial parasite, employing the same volunteer [BUCKLEY, *loc. cit.*]. These observations run parallel with those of EDESON *et al.* [*ibid.*, 1960, v. 57, 929].

26 *Mansonia uniformis* were given an infective blood meal on a cat infected with human *B. malayi* in Kuantan, Malaya, and they were flown to London in September 1958. (The technique by which this remarkable success was obtained is detailed.) There was a minimal loss of three insects. The remainder were kept alive for different periods and from these 70 infective larvae were recovered 44 of which were injected subcutaneously (October 2, 1958) into the same volunteer, on the thighs and calves. A cat, as control, received 26 larvae injected into the groins.

At the beginning the percentage of eosinophils in the blood was about 2%, but this figure rapidly rose to 13% in the fourth week and thereafter with fluctuations to a peak of 74% in a period of 26 weeks. Treatment with diethylcarbamazine resulted in a sudden and rapid fall to near normal. The blood picture was typical of an eosinophilic leucocytosis.

Of the filarial complement-fixation tests performed on five occasions the highest titre was 1 in 160. The last in July 1959 gave a weak reaction within normal limits. An intradermal filarial antigen inoculation on October 14, 1958, gave a strongly positive reaction. Repeated weekly examinations of thick blood smears for microfilariae were consistently negative, and a similar result took place in the control cat.

Clinical manifestations during this experiment consisted of a transitory lump in the popliteal region, and transitory oedematous swellings in the left ankle and right thigh. An almost diagnostic, but distressing, "wheezy" cough, identical with that experienced in previous inoculations with monkey and cat filariae and which coincided with the peak eosinophilia, appeared some 25 weeks after the original inoculation (compared with 14 and 10 weeks in the previous experiments, already referred to).

These results are regarded as anomalous, in the face of the generally accepted theory that tropical pulmonary eosinophilia is the result of parasitization with filarial larvae of animal origin. It is possible that persons who are sensitized by filarial infection, whether of human or animal origin, are specially liable to develop the eosinophilic syndrome on subsequent infection. This, however, is at present speculative. The high eosinophilia and leucocytosis which are not usually associated with human infections with *B. malayi* might

also be explained on the grounds of pre-sensitization. This is supported by the slow but gradual rise of the eosinophilia. The strong reactions to the complement-fixation test, which is *not* a feature of human *B. malayi* infection may also be explained by pre-sensitization. The non-appearance of microfilariae in the blood tallies with the well known but unexplained fact that in communities with a high microfilaraemia rate there are always some persons whose blood never contains microfilariae (as in the experiments by Edeson *et al.* [*loc. cit.*] in 2 volunteers inoculated with *B. malayi*).

The "zoonotic" theory of the mechanism of tropical pulmonary eosinophilia is not supported by the experiments on volunteers by Edeson *et al.* [*loc. cit.*], for neither of the two inoculated with the animal species (*B. pahangi*) developed manifestations of the disease, but the behaviour of the parasite and the host reaction followed the course of a *B. malayi* infection in man. This gave rise to the aphorism: "Parasitism involves a host as well as a parasite, and the end result of any infection may be determined more by the host's response than by the strain of parasite." This, however, may not be the whole truth. It may well be that the strain of the parasite *may* be just as important, or even more important, than the host in determining the ultimate result of such infections. In this dilemma it has been found by Wilson *et al.* [this *Bulletin*, 1959, v. 56, 551] that there are at least two strains of *B. malayi* in Malaya. It is quite possible, therefore, that more than one strain of *B. pahangi* may also exist: one which is capable of infecting both man and animals, but in the former produces the signs and symptoms characteristic of a normal *malayi* infection in man, and another to which man is refractory and which results in the exaggerated reactions of tropical pulmonary eosinophilia, as in Buckley's original experiment. Speculations such as these may be applied to a *W. bancrofti* occult infection of man and its association with tropical pulmonary eosinophilia as described by Webb *et al.* [*ibid.*, 1961, v. 58, 855].

[This original and most important communication is deserving of high praise on account of the devotion to self-imposed scientific experiment which it displays. It is worthy of the high occasion for which it was composed.]

Philip Manson-Bahr

Laurence, B. R. & Pester, F. R. N. **The Ability of *Anopheles gambiae* Giles to transmit *Brugia patei* (Buckley, Nelson & Heisch).** *J. Trop. Med. & Hyg.* 1961, July, v. 64, No. 7, 169–71. [13 refs.]

Anopheles gambiae and *Mansonia uniformis* were placed together in the same cage and allowed to feed upon an anaesthetized cat infected with *Brugia patei*. The average number of microfilariae ingested per mosquito was 44 in *A. gambiae* (range 12–83) and 131 in *M. uniformis* (39–302). The mosquitoes were dissected at intervals ranging from 2 minutes to 11 days after feeding. In *M. uniformis* nearly all the microfilariae had left the stomach within the first hour, but in *A. gambiae* over 90% died in the stomach, most within the first hour. Those few microfilariae which reached the thorax of *A. gambiae* then developed just as rapidly as in *M. uniformis*, infective larvae being found on the eighth day after the infecting meal.

The ability of *B. patei* to develop in *A. gambiae*, which is the usual vector in Africa of the human parasite *Wuchereria bancrofti*, again emphasizes the risks of confusing human and animal filarial larvae found in mosquitoes.

J. A. Reid

JAYEWARDENE, L. G. **Microfilariae of *Brugia* sp. in Dogs.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1961, July, v. 55, No. 4, 398.

Microfilariae of *Brugia* sp. are reported for the first time from dogs in Ceylon. Should the adult worms prove to be *B. malayi*, the dog must be considered as a possible reservoir host. Dogs have been inoculated with *B. malayi* experimentally in Malaya, but have not been found naturally infected there, though the dog is a natural host of *B. pahangi* in that country. *B. pahangi* has not been found in man or animals in Ceylon, but filarial worms of the *Brugia* type have recently been recorded there in a hare [this *Bulletin*, 1961, v. 58, 1165].

H. J. O'D. Burke-Gaffney

NAIR, C. P., RADHAGOVINDA ROY & RAGHAVAN, N. G. S. **Susceptibility of *Aedes albopictus* to *Dirofilaria repens* Infection in Cats.** *Indian J. Malariology*. 1961, Mar., v. 15, No. 1, 49–52.

It is a good vector.

NELSON, G. S. **On *Dipetalonema manson-bahri* n.sp., from the Spring-Hare, *Pedetes surdaster larvalis*, with a Note on its Development in Fleas.** *J. Helminthology*. 1961, v. 35, Nos. 1/2, 143–60, 13 figs. [28 refs.]

WILLIAMS. P. **Studies on Ethiopian *Chrysops* as possible Vectors of Loiasis. II. *Chrysops silacea* Austen and Human Loiasis.** *Ann. Trop. Med. & Parasit.* 1960, Dec., v. 54, No. 4, 439–59, 49 figs. [14 refs.]; 1961, Apr., v. 55, No. 1, 1–17, 4 text figs. & 4 figs. on 2 pls. [26 refs.]

Paper I of this series, by W. CREWE in 1954, was reported at the time [this *Bulletin*, 1955, v. 52, 67]. The two present papers are in continuity, with summary and references at the end of the second.

An account is given of the development of *Loa loa* (human strain) in laboratory reared *Chrysops silacea*, the work being done at Kumba in the Cameroons. At conditions of 82·6°–86·6°F. and 92% relative humidity, the infective larval stage developed in 7 days, the larvae moulting twice and undergoing development in the fat-body (mainly in the abdomen) until after the second moult when they become, as infective larvae, free to migrate forwards. Some delay or arrest, but not encapsulation, of developing worms occurs in this satisfactory vector, so that such events are not, with other tabanid species, necessarily indicative of a poor vector. There is some considerable discussion of reasons for this retardation with some preference for the view that flies may produce an inhibiting substance. Delayed larvae have not generally been reported from wild-caught flies, although "double infections" are recorded. A substantial part of the first paper is a detailed morphology of the developing stages of *Loa loa* in *Chrysops*, amply illustrated by 49 excellent line drawings. One puzzling anomaly was a bred-out fly which developed, by the third day after its only infecting blood meal, three third stage larvae free in the haemocoele; all other larvae in the fly were first-stage larvae typical of this time interval.

These papers provide, the author concludes, a detailed statement of *Loa loa* (human) development in *Chrysops silacea*—undoubtedly the most important vector of human loiasis—which establishes criteria for comparison [in the laboratory] of the potential efficiency of other *Chrysops* species.

D. S. Bertram

PRICE, D. L. **The Occurrence of Microfilariae of *Onchocerca volvulus* in Urine of Infected Individuals.** [Research Notes.] *J. Parasitology*. 1961, Aug., v. 47, No. 4, Sect. 1, 572.

Microfilariae of *Onchocerca volvulus* are rarely seen in man in sites other than the skin, subcutaneous tissues and eyes. The present author, from the Walter Reed Army Institute of Research, Washington, and Makerere College, Kampala, Uganda, has found such microfilariae on 7 occasions in urine samples taken from 300 Africans: 6 were from pygmies in the Congo and 1 from an African in Uganda.

Since these microfilariae do not usually utilize the blood stream, their presence in the urine suggests that they migrate through the tissues more extensively than has been reported previously. The author has already suspected that adults of *O. volvulus*, like many other filarioid parasites, are not confined to subcutaneous tissues but migrate within intramuscular fascia, and suggests that the presence of microfilariae in the urine may result from the presence of adult worms in the deeper tissues of the pelvic region.

H. J. O'D. Burke-Gaffney

KEELING, J. E. D. **Experimental Trichuriasis. II. Anthelmintic Screening against *Trichuris muris* in the Albino Mouse.** *J. Parasitology*. 1961, Aug., v. 47, No. 4, Sect. 1, 647–51. [35 refs.]

"1. Methods are described for testing compounds against *Trichuris muris* in the mouse.

"2. Tests against this organism were performed with bephenium hydroxynaphthoate, n-butyl chloride, diethylcarbamazine citrate (Banocide), 1:8 diphydroxyanthraquinone, dithiazanine iodide (Telmid), ficin, hexachloroethane, hexylresorcinol, oil of chenopodium, phthalofyne (Whipcide), piperazine phosphate, piperazine stearate, santonin, tetrachloroethylene B.P., and Vermizym. Only ficin and Vermizym were significantly active.

"3. The validity of the *T. muris* screen is discussed in the light of these results."

SANTOPADRE, G. & CATUREGLI, L. Il problema igienicosanitario delle infestioni aerodiffuse (indagini parassitologiche e rilevazioni sperimentali). [**The Public Health Problem of Air-borne Infections (Parasitological Investigations and Experimental Findings)**] *Riv. Italiana d'Igiene*. 1961, Jan.–Apr., v. 21, Nos. 1/2, 80–89. English summary (2 lines).

This investigation was carried out in a children's home on 23 boys, 32 girls, 12 doctors and 23 members of the doctors' households. Employing Graham's

technique with Scotch tape, the authors recovered the ova of *Enterobius vermicularis* from 46 of the child inmates (83·6%), 5 of the doctors (41·6%) and 2 subjects in the doctors' households (8·7%).

They searched for ova in the environmental atmosphere with an adaptation of the slit sampler, in which they substituted Scotch tape mounted on a coverslip for the slide which normally carries the culture medium. They sampled 300 litres of air at a time with standard exposures of 10 minutes at 140 cm. above floor level.

They carried out the air sampling in the children's playroom over a period of 10 days in succession except for Sunday, and investigated this atmosphere (a) before the children came in, (b) after the children had been in the room for 3 hours and (c) 10, 20 and 30 minutes after they had left. Dust was kept down as far as possible by careful waxing and polishing of the floors. No ova were recovered from 20 samplings at (a) but 12 of 20 samplings at (b) were positive. At (c) 10 samples were taken successively at 10, 20 and 30 minutes after the children's departure with positive result in 4, 1 and no sample respectively.

The authors also sampled the atmosphere of the room where children came for medical examination because of *Enterobius* infection. They found no ova before the children's arrival but found them in 16 out of 20 samples taken while the children were in the room. Ova were found in 5 out of 10, 3 out of 10 and 1 out of 10 of the samples taken 10, 20 and 30 minutes after the children left.

They say that this helminthic infection is endemic in many parts of Italy and they conclude that its control is far from being simply a matter of health education. The findings show, moreover, that doctors are exposed to a specific occupational risk when they are practising in an endemic area. *J. Cauchi*

FRANK, J. F. & WOOD, Olive E. **Trichinosis in Garbage-Fed Swine.** *Canadian J. Pub. Health.* 1961, Aug., v. 52, No. 8, 338–40.

"Examination of diaphragms from 789 swine originating from licensed garbage feeding premises in the four Atlantic Provinces revealed the presence of trichinellid larvae in only two diaphragms or 0·25%; both were from the same establishment. This is considerably lower than the 6 to 11% reported for garbage-fed swine in the United States during the years 1933 to 1939. At that time garbage fed to swine in the United States did not have to be cooked and the difference might be due to this factor."

[See this *Bulletin*, 1952, v. 49, 640.]

PHILLIPSON, R. F. & KERSHAW, W. E. **The Production, Deposition and Growth of the Larvae of *Trichinella spiralis*, and their Significance in the Chemotherapy of the Infection. II. Production and Deposition of Larvae.** *Ann. Trop. Med. & Parasit.* 1961, July, v. 55, No. 2, 231–4, 3 graphs.

Larvae of *Trichinella spiralis* were obtained from infected rats by mincing the carcase and digesting in acid pepsin at 37°C. for 4 hours. The larvae (20

larvae per gm. mouse) were given to mice by stomach tube. To recover the larvae from mice, the carcase was skinned and eviscerated, and fat was removed. It was then minced, mixed with saline and shaken with glass beads. It was filtered and resuspended thus 3 times and the larvae present in the combined filtrates were counted. Alternatively the muscles were digested with acid pepsin as before.

Larvae were not recovered from the muscles of infected mice 114 hours after infection (day 5) but a small number were recovered at 138 hours (day 6). After that the number per gm. of mouse tissue increased steadily up to day 15 after which there was little general increase.

Adult worms were still present in the intestines in several mice on the 21st day, and very small larvae were found in the muscles on the 28th day, so it is possible that in the later stages as many larvae are destroyed as are deposited. Very few larvae could be found in the blood at the height of larval production between the 7th and 11th days, so they seem to leave it rapidly and settle down in the tissues. If infection in man follows the same time-pattern that it does in mice, then most of the larvae are deposited in the muscles before the symptoms appear.

[For Part I see this *Bulletin*, 1960, v. 57, 1296.] *F. Hawking*

DEFICIENCY DISEASES

BROWE, J. H., BUTTS, J. S., YOUMANS, J. B., WHITE, P. L., CONSOLAZIO, C. F., HAND, D. B., PETERSON, A. G., HURSCH, L. M., TADAYON, M., DEYHIMI, S., DEYHIMI, R., AFRAKTEH, A. K., FRENCH, C. E. & SCHAEFER, A. E. **A Nutrition Survey of the Armed Forces of Iran.** *Amer. J. Clin. Nutrition.* 1961, July–Aug., v. 9, No. 4, Pt. 1, 478–514, 4 figs. [39 refs.]

WILLIAMS, R. R. **Towards the Conquest of Beriberi.**

This book was reviewed on p. 1199.

SCRIMSHAW, N. S. & BÉHAR, M. **Protein Malnutrition in Young Children. Malnutrition is still a Major Factor in the High Morbidity and Mortality in Underdeveloped Areas.** *Science.* 1961, June 30, v. 133, 2039–47, 10 figs. [Numerous refs.]

This is an excellent description of the basic features of kwashiorkor. Regular readers of this *Bulletin* are not likely to find anything new here, but the account can be strongly recommended to clinicians and welfare workers going for the first time to an area where the disease is endemic. The article is well illustrated and has a good small bibliography. *R. Passmore*

CHAUDHURI, R. N., BHATTACHARYYA, A. K. & BASU, A. K. **Kwashiorkor and Marasmus in Calcutta.** *J. Indian Med. Ass.* 1961, June 16, v. 36, No. 12, 557–65, 5 figs. [33 refs.]

This paper summarizes the findings in undernourished and malnourished children admitted to hospital in Calcutta. The importance of poverty as a cause and an infectious illness as a precipitating factor is stressed. Milk is recommended as the best therapeutic agent, but vegetable protein preparations also gave satisfactory results. The paper can be recommended as a practical account of malnutrition, especially suited to the needs of Indian physicians.

R. Passmore

SEN GUPTA, P. C., MUKHERJEE, A. M. & CHATTERJI, A. **Histopathological Changes in the Kidney in Kwashiorkor Syndrome.** Reprinted from *Indian J. Path. & Bact.* 1960, Apr., v. 3, No. 2, 93–9, 10 figs. on 5 pls. [15 refs.]

Paraffin sections were made from formol fixed kidney tissue removed at autopsy from 8 cases of classical and 2 cases of marasmic kwashiorkor. Histological examination revealed a number of pathological changes, many of which were similar to lesions described in children with kwashiorkor elsewhere. The epithelium of the glomerular tufts showed proliferation; there were hyaline changes in the glomeruli, and the basement membrane of the Bowman's capsule showed thickening and wrinkling. There were degenerative changes in the tubules, especially in the proximal convoluted tubules, with some degree of cloudy swelling and hydropic degeneration, and casts which, on histochemical examination, were thought to consist mainly of neutral mucopolysaccharides.

The lesions were considered to resemble changes seen in the kidneys in some hepatic disorders and in ulcerative colitis. It was suggested that they might to some extent be caused by accumulation of vasopressor material in the blood as a result of hepatic insufficiency. *Ruth Schwartz*

CHATTERJI, A. & SEN GUPTA, P. C. **Adrenals in Malnourished and Undernourished Infants.** Reprinted from *Indian J. Pediatrics.* 1960, Oct., v. 27, No. 153, 353–63, 5 figs. [25 refs.]

Adrenals were obtained at autopsy from 6 cases of kwashiorkor, 5 cases of "marasmic kwashiorkor" and 2 cases of marasmus. Paraffin sections were made with a number of different stains, and examined histologically. All the samples showed degenerative changes in the cortex, particularly in the outer part of the zona fasciculata. The lipoid material in the cortex, which was shown to be associated with the presence of cholesterol and free aldehydes, was depleted in patches. In 7 cases the foetal cortex was incompletely involuted, but the zona glomerulosa was well formed in all the adrenals examined and showed no signs of atrophy. The medulla was normal except in one instance, in which it exhibited signs of extramedullary haemopoiesis. Adenoma-like formations were seen in 5 cases and haemorrhages in the cortex and medulla in 8.

The article includes illustrative photographs and a detailed table of clinical findings. Most of the changes seen were considered to be of a general nature usually associated with certain acute and inflammatory conditions, but not specifically indicative of malnutrition. The absence of lipoid material in parts of the zona fasciculata, however, was thought to be evidence of cell exhaustion and atrophy. *Ruth Schwartz*

WATERLOW, J. C. **The Rate of Recovery of Malnourished Infants in relation to the Protein and Calorie Levels of the Diet.** *J. Trop. Pediatrics.* London. 1961, June, v. 7, No. 1, 16–22. [23 refs.]

44 malnourished infants were treated with 6 different milk mixtures. These provided a protein intake varying from 2·1 to 1·9 gm./kgm. body weight per day and an energy intake from 87 to 243 kcal./kgm./day. The infants gained weight at rates varying from 1·3 to 15·8 gm./kgm./day. The gain in weight was significantly related both to the amount of protein and the amount of calories consumed, but more closely to that of the calories.

After a theoretical discussion, it is concluded that 10 kcal. may be needed for the laying down of 1 gm. of tissue. Observations are reported which show that during rapid gain in weight oxygen consumption may be double the normal basal value.

On the practical side, it is recommended that the aim of treatment should be an intake of about 150 kcal./kgm./day and 3–4 gm. protein/kgm./day. The high calorie intake can be provided by full cream milk or by vegetable oils. In the author's experience these are usually well tolerated (after the first 2–3 weeks). *R. Passmore*

HAEMATOLOGY

ZANNOS-MARIOLEA, Leda & KATTAMIS, C. **Glucose-6-Phosphate Dehydrogenase Deficiency in Greece.** *Blood.* 1961, July, v. 18, No. 1, 34–47, 3 figs. [29 refs.]

Biochemical findings in Greek patients with favism, and their relatives, agreed with previous reports. Apart from this the main points made are as follows.

(1) In patients experiencing an attack—examined usually on the second to fourth day—some degree of instability of erythrocytic glutathione (GSH) was regularly demonstrated. This was not as great as in sensitive subjects examined between attacks, but it was enough to show that the biochemical defect could be detected during a bout of haemolysis in Caucasian subjects. The Motulsky screening test was positive, but rather less sensitive.

(2) In all fathers of female patients with favism, the GSH stability test and the Motulsky test were both abnormal.

(3) In 31 of the mothers of patients, 26 had decreased GSH stability, but in 13 of these the Motulsky test was normal.

(4) In children, the age incidence of attacks of favism was maximal at 3 to 6 years, and thereafter declined rapidly. *Alan B. Raper*

VELLA, F. & IBRAHIM, S. A. **Thalassaemia in an English and in a German Family.** [Correspondence.] *Nature*. 1961, Aug. 19, v. 191, 822. [19 refs.]

VELLA, F. **Haemoglobin S in Khartoum.** *East African Med. J.* 1961, July, v. 38, No. 7, 350–52.

"The study, by paper electrophoresis at alkaline reaction, of 1,430 blood samples submitted to the Pathology Laboratory of the Khartoum General Hospital and to the Stack Medical Research Laboratories, has revealed 22 instances of hæmoglobins A and S, and five of S and F. The great majority of the blood samples studied had come from Sudanese 'Arab' patients. Amongst 24 hospitalized children with anæmia and splenomegaly two were found with a pattern of hæmoglobins S and F, and two of A and F; of the latter one had come from a child suffering from Cooley's anæmia and the other from her nine-month-old sister."

MANFREDI, F., SPOTO, A. P., SALTZMAN, H. A. & SIEKER, H. O. **Studies of Peripheral Circulation during Sickle-Cell Crisis.** *Circulation*. New York. 1960, Oct., v. 22, No. 4, Pt. 1, 602–7, 3 figs. [16 refs.]

Arterial blood oxygen content and saturation, *p*H, and haemoglobin were determined by means of a Van Slyke apparatus and a spectrophotometer in 18 Negro subjects (aged 16–48 years) with sickle-cell disease, 6 anaemic patients and 3 febrile patients.

Of the 18 subjects, 16 studied between crises, or just after a crisis, had a decrease in mean oxygen saturation from the normal 95–102% to 87·9%. Mean superficial vein oxygen saturation was normal (66·5%) and mean arterio-venous (A-V) oxygen difference was also normal (2·37 vol. %). In crisis oxygen saturation was low (86·6% in 7 patients) but venous oxygen saturation was high (81·9%) and mean A-V difference correspondingly low (0·47 vol. %). Blood from deep veins yielded a normal oxygen content and A-V difference even during a crisis. The mean A-V *p*H difference during crisis was 0·010, and 0·042 when not in crisis.

The evidence suggests that arterialization of venous blood is caused by A-V shunts and that the crisis may be precipitated by a vascular neurogenic mechanism. *M. L. Thomson*

HILKOVITZ, G. & JACOBSON, A. **Hepatic Dysfunction and Abnormalities of the Serum Proteins and Serum Enzymes in Sickle-Cell Anemia.** *J. Lab. & Clin. Med.* 1961, June, v. 57, No. 6, 856–67, 1 fig. [26 refs.]

Liver function was studied by a number of biochemical estimations in a series of 14 patients, 13 of whom were examples of true homozygous sickle-cell disease and 1 probably suffered from sickle-cell thalassaemia [microdrepanocytic disease]. Their ages ranged from 7 to 38 years, the sexes were equally represented and the series included 2 females of 38 and 27 years. [Though no information as to race is given, since the paper comes from Richmond, Virginia, it seems clear that they were of American Negro stock.]

The liver was palpably enlarged in 70% of the patients. Though most of them were relatively asymptomatic when studied, 2 had symptoms suggesting thrombotic crisis, and a third had fever, jaundice and marked hepatomegaly. 2 further patients had active tuberculosis but showed little evidence of liver dysfunction.

Each patient was admitted to hospital for 4 days for investigation, during which period total urobilinogen and urinary coproporphyrin outputs were estimated. Exhaustive blood investigations comprised estimation of haemoglobin and reticulocytes, serum proteins, prothrombin, pseudo-cholinesterase, thymol turbidity, thymol flocculation, cephalin flocculation and the 2 standard transaminases SGOT and SGPT, together with the serum lactic dehydrogenase (SLD). Bromsulphthalein retention was also estimated and serum electrophoresis was carried out.

The Hb concentrations ranged from 4·2 to 9·4 gm. per 100 ml. except in 1 patient who had received blood transfusions and had an Hb level of 11·4 gm. per 100 ml. Reticulocyte counts ranged from 6 to 70% but most were between 20 and 40%.

The results of the numerous investigations are set out in 4 detailed tables and cannot be abstracted. A study of these however shows that liver function was disturbed in every patient, though the pattern of biochemical abnormality was complex and inconstant. The only 2 subjects who showed a normal pattern of serum proteins were also the only patients whose serum enzymes showed little disturbance, only the SLD showing minor increases. In every other patient, abnormality of serum protein production was reflected in abnormal levels of the serum enzymes tested. The prothrombin concentration was decreased in every patient, however, the levels ranging from 27–60%. The only constant relationship which emerged from this battery of tests was that existing between the Hb concentration and the 24-hour excretion of coproporphyrins; this was inverse and was statistically significant. [This indicated that lower Hb concentrations were associated with increased haem synthesis due to marrow hyperplasia evoked by greater haemolysis: individual reticulocyte counts might not always illustrate this.]

One patient, a female of 27 years, was gravely ill with fever, gross hepatomegaly, icterus and severe bone pains. Though her liver was clearly severely deranged and the SLD was increased twofold over its level during the earlier asymptomatic period, the levels of the turbidity, flocculation tests, SGOT and SGPT were better than in the asymptomatic phase. There was no evidence of biliary obstruction from pigment stones. [This last example illustrates the extreme difficulty in the interpretation of a range of biochemical tests of liver function, which reflects a complex interplay of variation in marrow activity, haemolysis and oxygen and nutrient supply to the liver cells. The last depends upon several factors, including the Hb concentration, varying degrees of hepatic sinusoidal occlusion and a probable diffusion defect (WALTERS, *Proc. Roy. Soc. Med.*, 1958, v. 51, 646).]

[In the abstracter's opinion, more positive information on the derangement of the liver is obtainable by biopsy, though this procedure may be contraindicated by a low prothrombin level which cannot be raised to 75%.]

The authors draw attention to the fact that in this disease liver function becomes worse as age increases and may terminate in cirrhosis and death. Though no fatty overload or other evidence of a nutritional deficiency was found in

the present series, lack of adequate protein and vitamin supplies may obviously affect adversely a vital organ already subjected to stress, and such deficiencies should be guarded against.

[Those interested in the biochemistry of liver damage should consult this most interesting paper in the original.] *J. H. Walters*

VENOMS AND ANTIVENENES

DEKEYSER, P. L. & DERIVOT, J. Serpents et venins; morsures et traitements. **[Snakes and their Venoms: Snakebite and its Treatment]** *Notes Africaines.* Dakar. 1960, Jan., No. 85, 1–35, 67 figs. [47 refs.]

This is an excellent article, aimed at the layman, as well as the medical practitioner. The authors have brought together a great deal of information on the poisonous snakes of West Africa and have presented it in a simple, straightforward manner. There are many clear line-drawings (mostly original) and photographs which illustrate and supplement the text.

A description is given of the poisonous "apparatus" of venomous animals, and of the way in which various species of snakes deliver venom through their fangs.

The constituents, pharmacological effects, physical and immunological properties of venoms from various species are discussed. Antivenenes are listed and described and the packing of mono- and polyvalent sera available from the Pasteur Institute are illustrated. There is a comprehensive section on methods of treatment; full and clear directions are given for the action to be taken in a case of snakebite. A list of requisites for a travelling "kit" is given and appropriate polyvalent sera are recommended for desert, savannah or forest journeys.

The article concludes with a simplified, illustrated key for the identification of West African poisonous snakes and an account of their geographical distribution.

[A translation of this article would be of use in the English-speaking areas of West Africa.] *L. G. Goodwin*

KEEGAN, H. L., WHITTEMORE, F. W., Jr. & FLANIGAN, J. F. **Heterologous Antivenin in Neutralization of North American Coral Snake Venom.** *Pub. Health Rep.* Wash. 1961, June, v. 76, No. 6, 540–42.

Although the neutralization of snake venom by the antivenene prepared from a related snake may frequently be achieved it does not always mean that paraspecific action in antivenenes can always be expected. In the particular case reported here it was found, however, that antivenene prepared against the South American coral snakes, *Micrurus corallinus* and *M. frontalis*, was effective in protecting white mice against the effects of the venom of the North American coral snake, *M. fulvius fulvius*. The level of protection offered was of a high order. *H. J. Bensted*

FISCHER, F. J., RAMSEY, H. W., SIMON, J. & GENNARO, J. F., Jr. **Antivenin and Antitoxin in the Treatment of Experimental Rattlesnake Venom Intoxication** (*Crotalus adamanteus*). *Amer. J. Trop. Med. & Hyg.* 1961, Jan., v. 10, No. 1, 75–9, 2 figs. [12 refs.]

Until the recently introduced Wyeth multivalent rattlesnake antivenene [this *Bulletin*, 1957, v. 54, 898] became available there was no satisfactory specific remedy available in the United States against rattlesnake bites, according to the authors of this paper. It was thought that the tissue necrosis observed round the site of the bite was due to clostridial infections introduced at the time of the snakebite and it appears to have been a common practice to treat these bites with tetanus antitoxin and gas gangrene antitoxin.

The experiments with rabbits described here showed that clostridia were not present in the milked venom and that clostridial antitoxins had no therapeutic effect, but that this new polyvalent antivenene had a marked protective effect against death in the experimental animal and also against the local necrotic effect of the venom. It is possible that in some cases of natural snakebites gas gangrene and tetanus organisms might be introduced into the wound at the time of the bite, but unless there is laboratory evidence of clostridial contamination of the wound the authors consider that tetanus or gas gangrene antitoxin treatment is unnecessary and even contraindicated. *H. J. Bensted*

TATENO, I.; SUZUKI, S.; KITAMOTO, O.; CHIKU, N.; SAWAI, Y. **Anticoagulant Activity of Habu Snake Venom** (*Trimeresurus flavoviridis*). **I. Anticoagulant Activity of Crude Habu Venom** [TATENO, SUZUKI, KITAMOTO, CHIKU & SAWAI]. *Japanese J. Exper. Med.* 1960, Dec., v. 30, No. 6, 409–19, 6 figs. [28 refs.] **II. Effect of Crude Venom on Blood Vessels and Fibrin Clots** [TATENO, SUZUKI, CHIKU & KITAMOTO]. *Ibid.*, 421–6, 2 figs. [10 refs.]

I. The action of habu snake venom on several components of the clotting mechanism of plasma has been studied. The main effect was antagonism to the action of thromboplastin. 1 mgm. of dried, crude venom inhibited the coagulation of 10 ml. of human plasma. A rough calculation suggests that incision and suction at the site of a habu snakebite is unlikely to remove a significant amount of venom.

II. Venom applied to the chorioallantoic membrane of 11- to 12-day-old chick embryos caused haemorrhages; a dose of 0·01 mgm. of dried venom was lethal in 30–60 minutes. Capillary haemorrhages resulted from a dose of 1 μgm. but the embryos survived. Fibrin clots of human plasma were lysed by venom solutions containing 0·1 mgm./ml. *L. G. Goodwin*

SAWAI, Y., MAKINO, M., MIYASAKI, S., KATO, K., ADACHI, H., MITSUHASHI, S. & OKONOGI, T. **Studies on the Improvement of Treatment of Habu Snake Bite. I. Studies on the Improvement of Habu Snake Antivenin.** *Japanese J. Exper. Med.* 1961, Apr., v. 31, No. 2, 137–50. [14 refs.]

In a survey of the Amami Oshima islands the authors concluded that the antivenene used for the treatment of Habu snakebite (*Trimeresurus flavoviridis*)

was not very effective. Little protection was afforded against local haemorrhagic, necrotic lesions. In outlying areas no refrigerators are available and the crude, liquid antivenene prepared at the Institute for Infectious Diseases of Tokyo University deteriorates.

The paper describes an attempt to improve the effectiveness and stability of the antivenene. The addition of Freund's adjuvant decreased the toxicity of the venom to horses and enabled satisfactory titres to be obtained in shorter periods and with smaller amounts of venom than before. The antibodies were precipitated from the crude immune serum with ammonium sulphate, dialysed and freeze-dried under vacuum. Addition of 2% to 5% of glycine or sodium glutamate before drying rendered the product more readily soluble and easier to reconstitute.

Assays of potency in mice and rabbits showed that the protective value of the antibody was less than expected when large doses of venom were used. The authors suggest that the antivenene should be standardized on the maximum amount of venom neutralized by a dose of undiluted antivenene.

Intravenous injection of the antivenene was more effective than infiltration at the site of inoculation of venom.

Purified antivenene, given intravenously, protected rabbits against the local effects of an intramuscular injection of venom. The antivenene was effective if given one hour after the venom.

Tests are in progress to determine the stability of the purified antivenene under field conditions. *L. G. Goodwin*

TOXOPLASMOSIS

Jírovec, O., Horácková, Milada, Jírovcová, Marie, Jíra, J., Šmíd, J., Valentová, Jiřina & Vosta, J. Studie o toxoplazminové reakci. II. Sdělení. [**Studies on the Toxoplasmin Reaction. II. Examination of some Groups of the Normal Population**] *Československ. Epidemiol., Mikrobiol., Imunol.* Prague. 1961, v. 10, No. 3, 197–205. [17 refs.] English summary.

Between 1957 and 1960 the authors carried out the toxoplasmin skin test on 3,232 persons living in 5 areas in southern Bohemia. Among 937 children positive results were obtained in 7 of 101 (6·9%) aged 2–5 years, 64 of 257 (24·9%) aged 6–10 years, and 257 of 937 (27·4%) aged 11–15 years, and among 773 adolescents aged 14–19 years 234 (30·3%) gave a positive result. The percentage of positive results ranged from 41·3% to 75·8% in 242 persons aged over 50 years who were examined in several groups, and from 33·5% to 54·5% in groups of persons who were exposed to the risk of laboratory or occupational infection. *D. J. Bauer*

SIMITCH, T., BORDJOCHKI, A., PETROVITCH, Z., TOMANOVITCH, B. & SAVIN, Z. La toxoplasmose des oiseaux. I. L'infection naturelle de la volaille domestique par *Toxoplasma gondii* en Yougoslavie. [**Toxoplasmosis in Birds. I. Natural Infection of Domestic Poultry in Yugoslavia**] *Arch. Inst. Pasteur d'Algérie*. 1961, June, v. 39, No. 2, 135–9. [18 refs.]

Toxoplasmosis is well-recognized in birds, but no survey of the incidence in them has hitherto been made in Yugoslavia. The authors, from Belgrade, have studied 1,243 domestic fowls in Serbia during the last 2 years for the presence of *Toxoplasma gondii*. Suspensions of brains from the birds were inoculated subcutaneously into the souslik, *Citellus citellus*, and when *T. gondii* was present the animals died with acute infection in 11–24 days.

Details are given of the findings in each of 6 species of poultry examined: they were obtained from markets in Belgrade and in Nich in Southern Serbia.

12 strains of *T. gondii* were isolated from 5 of the 6 species of fowl, namely 2 (0·25%) from 786 hens, 2 (6·2%) from 32 guineafowl, 2 (3·8%) from 52 turkeys, 5 (3·6%) from 136 ducks, and 1 (1·05%) from 95 geese: all of 142 domestic pigeons were negative.

The virulence of these 12 strains will be the subject of a further study.

H. J. O'D. Burke-Gaffney

MRÁZ, J. Přežívání *Toxoplasma gondii in vitro*. [**The Survival of** *Toxoplasma gondii in vitro*] *Českoslov. Parasit.* Prague. 1959, v. 6, No. 1, 165–72. [14 refs.]

The author has studied the survival time of *Toxoplasma gondii* maintained *in vitro* at various temperatures. A preparation of toxoplasms in the form of peritoneal exudate from infected mice was sealed in Pasteur pipettes and tested for infectivity by injection into mice after various periods of storage. By this means it was found that the organisms survived for 18 days at room temperature, 32 days at 3° to 5°C., 7 days at –6° to –8°C., and for 5 days at the last temperature when frozen and thawed twice. *D. J. Bauer*

MRÁZ, J. K otázce perorálního přenosu toxoplasmosy. [**The Oral Transmission of Toxoplasmosis**] *Českoslov. Parasit.* Prague. 1959, v. 6, No. 1, 159–64. [11 refs.]

Experiments on the transmission of toxoplasmosis to mice by the oral route were carried out with the IM strain of *Toxoplasma gondii*. Of 30 mice allowed to feed on the livers and spleens of mice suffering from acute toxoplasmosis 24 developed the disease and died after 8–9 days. At autopsy massive invasion of the organs was observed. It was not possible to transmit the disease with milk mixed with infected peritoneal exudate, or by the bites of ticks of the species *Ornithodoros moubata, O. papillipes* and *O. hermsi* which had fed on infected mice. Toxoplasms removed from the stomachs of mice at intervals after oral administration and tested for viability by injection into mice were found to resist the action of the gastric juice for 2–2½ hours. *D. J. Bauer*

MRÁZ, J. Přenos toxoplasmosy přes sliznice a kůži. [**The Transmission of Toxoplasmosis *via* the Mucous Membranes and the Skin**] *Československ. Parasit.* Prague. 1959, v. 6, No. 1, 173–7. [13 refs.]

35 mice which were inoculated intranasally or in the undamaged conjunctival sac with a peritoneal exudate preparation of *Toxoplasma gondii* all developed fatal generalized toxoplasmosis, and the possibility of transmission of the infection by these routes was thus clearly demonstrated. It was also possible to transmit the infection by applying the material to the lightly scarified skin for 10 minutes. No sign of infection could be observed in females left in contact with infected males, or in the litters subsequently born to them.

D. J. Bauer

SERGENT, G. & VIAL, G. Toxoplasmose du foetus de la souris gestante. [**Toxoplasmosis in the Mouse Foetus**] *Ann. Inst. Pasteur.* 1961, Aug., v. 101, No. 2, 288–90, 1 fig.

On the seventh day after inoculation of a mouse, in the second passage, with human blood from a subject with toxoplasmosis a foetus was removed at autopsy. In the superficial layers of the ectoderm and in the mesoderm it was observed that about 1 cell in 10 was about twice the normal size. These cells contained a liquid material with a central hyperchromatic agglomeration of toxoplasms which had transformed the cell into a " pseudocyst ". There was no inflammatory reaction and this was in fact a pure culture of the parasites multiplying in fully active tissue, as has been seen with the adult parasite in tissue culture [this *Bulletin*, 1954, v. 51, 978]. Only the minor " corpuscular " forms of *Toxoplasma gondii* [*ibid.*, 1960, v. 57, 403] were found in sections of the brain from the parent mouse. Evidently the foetus of naturally or experimentally infected mice constitutes an excellent culture medium for *T. gondii*.

H. J. O'D. Burke-Gaffney

VIAL, G., SERGENT, G. & BÉQUIGNON, R. Calcifications de la toxoplasmose, humaine et animale. [**Calcifications in Toxoplasmosis of Man and Animals**] *Ann. Inst. Pasteur.* 1961, Aug., v. 101, No. 2, 290–92.

While intracranial calcifications in toxoplasmosis are readily detected radiologically in human infants, such lesions do not seem to have been recorded in animals although the infection is frequent. This is largely presumably because such examinations are not commonly made in animals for practical reasons.

The authors have, however, often noticed in histological sections of nervous tissues from dogs or cats, stained by Mann's method, that a single section would show not only the usual hyperchromatic clusters of toxoplasms, but others which were grey or black and less brilliant. This picture was seen mostly in chronic infections, but was observed also in recent acute infections. Selective histochemical strains for calcium showed this to be calcification of the toxoplasms. Similar findings were observed in young cattle which had died from toxoplasmic encephalitis.

In human tissues, the cytochemical method of KOSSA [not described] shows calcifications of toxoplasms. The authors have used this in sections of human skin and uterine fibroma and have been able to detect calcification of the toxoplasm in both tissues. This can be seen even though Mann's stain shows no changes. No calcified depots were found by this method in toxoplasms in ascitic fluid of infected mice, but a high degree of calcification was found before the 8th day in the parasites found in " pseudocysts " in the mouse foetus [see above]. The affected cells contained a fibrinous fluid, probably of a mucoprotein nature, which it is tempting to associate with the mucoproteins taking part in normal osteogenesis.

The authors discuss briefly the possible mechanism of intracranial calcification and its pathological implications, and conclude that calcification is a normal development of toxoplasmic lesions in man and animals, not only in nervous but in other tissues. *H. J. O'D. Burke-Gaffney*

DERMATOLOGY AND FUNGUS DISEASES

CAM, C. Güneydogu anadoluda görülen deri porfirilerinin hususiyetleri. [**Cutaneous Porphyria**] *Saglik Dergisi*. 1960, Jan.–Feb., v. 34, Nos. 1/2, 46–62, 5 figs. [19 refs.] French summary.

The author describes (in Turkish, with a brief French summary) 279 cases of cutaneous porphyria seen at the Diyarbakir Numune hospital in 1956–1958. This is the " toxic skin porphyria " associated with wheat contaminated with the fungicide hexachlorobenzene. Readers will be familiar with this condition which has been fully described [this *Bulletin*, 1961, v. 58, 130, 131, 951]. Dr. Cam is Director of the Skin Clinic in Diyarbakir and was associated with the early studies of this condition, of which he has seen many cases.

H. J. O'D. Burke-Gaffney

SOSA-MARTÍNEZ, J. & PERALTA, S. **An Epidemiologic Study of Pinta in Mexico.** *Amer. J. Trop. Med. & Hyg.* 1961, July, v. 10, No. 4, 556–65. [24 refs.]

In an initial brief survey of pinta, it is pointed out that the mechanism of transmission and the part that vectors might play are incompletely known. The clinical manifestations fall into 3 stages. The primary stage is that of the papular initial lesion which spreads to form an erythemato-squamous patch 5–10 cm. in diameter with irregular margins and known in Spanish as *empeine* or *jiote*. The secondary stage appears later with generalized lesions similar to the empeine—which have been called pintides. The empeines and pintides may be red or blue. The accompanying hyperkeratosis with desquamation, itches, and fissures may form from which treponeme-rich serum may exude. In the tertiary stage these lesions become leukodermic. The colour changes in the

skin may cause social embarrassment. The usual treatment is 1·2 mega units of penicillin. Simuliidae have been thought to be concerned with transmission but at present most people think that direct contact, excluding venereal contact, is more important.

This paper reports a study in a pinta village in the state of Guerrero, Mexico, about 790 metres above sea level. The economic level was very low, sanitary facilities were inadequate and most people worked in agriculture. The population was interviewed by house-to-house visits: 2,110 people were studied and 761 pinta patients (36%) were found of whom 593 (77·9%) were examined clinically.

Although the authors express doubt about the reliability of patients' histories they considered as cases of pinta all with clinical manifestations of pinta and all who, although they had no lesions, had had the disease but had been previously treated. The prevalence increased with age but the increase was less after the age-group 30–39 years. Of 173 married couples, in 65·9% one partner had pinta.

Pinta was more frequent among the families of farm workers than among those who owned farms; the latter were perhaps a little less poor. Of the 519 families, 68 (13%) had no pinta patient; no explanation was found for this freedom. Children in families where the parents did not have pinta also did not have the disease. When only the mother had pinta, more children had the disease than when only the father had it. While at marriage one partner might not be infected, as years passed both tended to become infected. Of 44 initial lesions, most occurred (according to observation or history) in the 10–19 age-group (40·9%), and 68·2% were found in the 10–29 age-group. Of 593 patients examined, 7·5% had initial lesions, 56·5% showed discoloured lesions. All patients tested were sero-reactive to the VDRL test except 6 of 11 with initial lesions and 4 of 40 with depigmentation, but the last 4 had been treated.

The authors say that new infections were most numerous in children but the clinical manifestations became more frequent as age increased. Parents appeared to be the source of infection for their own children. All the usual biting diptera could be excluded but household biting arthropods such as bedbugs, ticks, triatomids and lice remained to be investigated. "It seems that the epidemiological characteristics of pinta do not differ very much from those known of tuberculosis and leprosy, which are considered to be transmitted by direct contact . . . There is still the possibility of a selective genetic predisposition or hereditary susceptibility to the disease as has been emphasized in leprosy." Several families stated that there had been no pinta in them for two generations. "Finally, we believe that in this study we have shown evidence that pinta is an infection which is transmitted mainly in the home from adults to other adults or children."

[The value of the paper is limited by the absence of adequate serological studies. However, this limitation may not be as great as it would be in other endemic treponematoses if latency in pinta, that is, infection without visible active lesions, is unusual or absent as has been reported by others. It has also been stated by other authors that patients remain infectious for many years so that parents infected in childhood may infect their own children. This is another difference from the other endemic treponematoses in which the duration of infectiousness is only about 3–5 years. Pinta is relatively poorly understood outside its endemic areas.] *C. J. Hackett*

BRUMPT, V. A propos de quatre mycétomes observés à Bobo-Dioulasso (Haute-Volta). [**Four Cases of Mycetoma observed in Bobo-Dioulasso (Upper Volta)** *Bull. Soc. Path. Exot.* 1960, July–Aug., v. 53, No. 4, 610–12, 2 figs. on pl.

Pathological material derived from 4 African patients who presented with mycetoma in various districts (Ivory Coast, Upper Volta, Niger) was examined histologically at Bobo-Dioulasso.

The organisms thus examined were: *Madurella mycetomi* in 1 case, *Streptomyces pelletieri* in 2 and a species having affinities with *S. madurae* in the fourth.

A notable feature of these cases was that none of the lesions occurred on the lower limbs, the sites in the 4 patients being as follows in each of them respectively: forearm (*M. mycetomi*); shoulder (species resembling *S. madurae*); lumbar region (*S. pelletieri*); arm (*S. pelletieri*). *C. J. La Touche*

EGEBERG, Margaret C., ELCONIN, Ann F. & EGEBERG, R. O. **Antifungal Agent.** *Science.* 1961, Aug. 18, v. 134, 472–3.

"From the soil of the San Joaquin Valley a fungus has been isolated, an extract of which inhibits the growth of *Coccidioides immitis* on Sabouraud's medium. An acute toxicity study in mice indicates a certain tolerance of the extract. Tentative identification indicates that the fungus is a penicillium."

CARNEIRO, J. F. Pneumotórax espontâneo bilateral na paracoccidioidose. [**Bilateral Spontaneous Pneumothorax in Paracoccidioidosis**] *Rev. Brasileira Med.* Rio de Janeiro. 1961, Mar., v. 18, No. 3, 190–91, 2 figs.

FAVA NETTO, C., DE BRITO, T. & LACAZ, C. da S. **Experimental South American Blastomycosis of the Guinea Pig. An Immunologic and Pathologic Study.** *Pathologia et Microbiol.* Basle. 1961, v. 24, No. 2, 192–206, 7 figs. [14 refs.]

The purpose of this paper is to report on the serological findings in animals experimentally infected with *Paracoccidioides brasiliensis* and to correlate them with the pathology. An attempt to increase the virulence of *P. brasiliensis* towards guineapigs was made by passage of the organism through that animal.

18 guineapigs were inoculated in the left testicle with a standard live suspension of *P. brasiliensis*; 39 days later *P. brasiliensis* recovered from one of these animals was similarly injected into 5 other guineapigs; 22 days later this passage was repeated from one of the latter to 5 further guineapigs.

Skin tests were carried out on all the animals at intervals, a polysaccharide extracted from the yeast phase of *P. brasiliensis* by the method described by FAVA NETTO [this *Bulletin*, 1957, v. 54, 354] being used as antigen. The animals were bled from the heart at intervals and the sera subjected to precipitin and complement-fixation tests in which the same antigen was used.

The animals were killed at intervals and subjected to complete necropsies, excluding the central nervous system. All the testes were examined histologically; other organs were also examined histologically when the gross appearances warranted it.

The skin test became positive in 20 animals, the peak being between 10 and 15 days after inoculation; thereafter the number of positives declined sharply. The precipitin test became positive in 15 guineapigs, usually 15 to 30 days after inoculation, but sometimes as late as 50 days. 16 animals showed positive complement-fixation tests, the times being the same as for the precipitin reactions. Titres in the last two tests rose and fell sharply at intervals in most of the animals.

The lesions seen in animals infected for periods of from 1 to 285 days are described in detail. None of the animals showed healing and circulating antibodies were demonstrable, albeit in low titres in many cases, till death. The disease produced remained largely confined to the testes, which were virtually destroyed, and spread was limited to the opposite testis in some cases. This spread occurred oftener with *P. brasiliensis* which had been passaged through guineapigs than with the original culture. It was noted that precipitin and complement-fixation tests became positive at the time of appearance of necrosis in the testes. The disease showed focal areas of recrudescence and the presumption is that the varying levels of circulating antibody titres are related to this.

[The authors do not make it clear what degree of correspondence there was between skin, precipitin and complement-fixation tests unless the sentence " we had a homogeneous serological behaviour in each group of animals inoculated at the same time " has some bearing on this aspect.] *Ian G. Murray*

TROPICAL ENVIRONMENTAL CONDITIONS

ELLIS, F. P. **Ecological Factors affecting Efficiency and Health in Warships.** *Brit. J. Indust. Med.* 1960, Oct., v. 17, No. 4, 318–26, 2 figs. [47 refs.]

The author reviews published work already abstracted in this *Bulletin* [see, for example, this *Bulletin*, 1954, v. 51, 223; 1955, v. 52, 405; 1959, v. 56, 883 *bis*; *Bull. Hyg.*, 1956, v. 31, 311].

BENZINGER, T. H. **The Quantitative Mechanism and the Sensory Receptor Organ of Human Temperature Control in Warm Environment.** *Ann. Intern. Med.* 1961, Apr., v. 54, No. 4, 685–99, 11 figs.

The author points out that in a steady state, *e.g.* the human subject at rest, a curvilinear relation may be demonstrated between sweating and skin temperature which might lead to the erroneous conclusion that the sensory organs in the skin control sweating and consequently body temperature regulation. The truth emerges during alternating exercise and work when it may be shown that there is no direct relation between skin temperature and rate of sweating.

Measurement of the internal cranial temperature by thermocouples near the hypothalamus (the heat-sensitive nucleus in the forebrain) shows an immediate and faithful relationship between the thermal stimulus and the response (sweating), which is in sharp contrast to the poor correlation found in the unstable state between rectal temperature and the thermal environment.

A similar effect can be demonstrated on the other main thermoregulatory reaction, namely, dilatation of the peripheral vessels. Here however there is also a direct effect of increased temperature on the blood vessels so that the picture is not so clear as in the case of sweating.

The three positions in which the hypothalamic temperature may be approximately measured are anterior ethoid, Rosenmüller's fossa and at the tympanic membrane in the external auditory canal. *M. L. Thomson*

GUTHRIE, J. & MCCRACKEN, A. V. **A Table for Treating Heatstroke.** *Lancet*. 1960, Mar. 26, 682, 1 fig.

The table is 7 ft. by 2½ ft. by 3 ft. high and has transverse 1-inch strips of aluminium set at 10-inch centres on which the patient lies during treatment. Chilled water at 45°F. (7°C.) is sprayed from above and below at the same time. It is claimed that rectal temperatures may be reduced by this combination of convective and evaporative cooling from 106-110°F. to 102°F. within 20 to 30 minutes. *M. L. Thomson*

MISCELLANEOUS DISEASES

MONEY, G. L. **Etiology of Funicular Myelopathies in Tropical Africa.** *World Neurology*. Minneapolis. 1961, June, v. 2, No. 6, 526–35. [32 refs.]

This paper summarizes the causation of diseases affecting the long tracts in the spinal cord and records the author's experience of these at University College Hospital, Ibadan, Nigeria, together with some centres in neighbouring West African territories; and at Makerere College Medical School, Mulago Hospital, Kampala, Uganda as well as in some rural centres in neighbouring East African territories.

After referring to the conditions which might be considered in differential diagnosis in temperate climates a summary of aetiological types of myelopathies in tropical practice is given: viral, rickettsial, and bacterial infections, protozoal and metozoal infections, deficiency states and exogenous intoxications, degenerative and heredo-familial disorders and primary demyelinating diseases. In each instance the author's personal experience is used to illustrate the conditions. More detail is given of tropical nutritional myelopathies including ataxic neuropathy and optic and sensory neuropathy.

This paper is valuable as a review of causes of spinal cord disease in the tropics, a subject which is of increasing interest as more adequate facilities for its investigation become available. [See also this *Bulletin*, 1958, v. 55, 933; 1959, v. 36, 868; *Bull. Hyg.*, 1960, v. 35, 137, 662.] *S. Bell*

MARTIN, G. R., MERGENHAGEN, S. E. & PROCKOP, D. J. **Influence of Scurvy and Lathyrism (Odoratism) on Hydroxyproline Excretion.** [Correspondence.] *Nature*. 1961, Sept. 2, v. 191, 1008–9. [15 refs.]

PARASITOLOGY: GENERAL

FORESI, C. & VANNUCCHI, G. Le parassitosi intestinali in provincia di Pisa. Risultati di un triennio di indagini e di inchieste. **[Intestinal Parasitism in Pisa Province. Results of a 3-year Period of Investigation and Enquiries]** *Riv. Italiana d'Igiene*. 1961, Jan.–Apr., v. 21, Nos. 1/2, 100–15. [23 refs.] English summary (9 lines).

The authors have examined specimens of faeces from 5,619 subjects: they indicate the laboratory technique which they have followed and tabulate their findings in some detail. They found an infection rate of over 41% with single or multiple species of helminths, other parasites or a combination of helminths and protozoa. They comment on their findings and refer to ages and occupation, and they distinguish between subjects whom they investigated in the course of random sampling and those whose faeces were examined because of signs and symptoms.

The authors estimate that 1 in 3 persons in Italy harbours intestinal parasites, and these are to be found in town as well as in country dwellers and in the well-to-do as well as in the poor. Many are symptomless excreters; indeed, some infection rates were higher in the random sampling of subjects who had expressed no complaints. In others the infection may give rise to chronic, sometimes vague, manifestations some of which may not suggest any association with the intestinal tract. *J. Cauchi*

NAGATY, H. F., EL-GINDY, M. S. & RIFAAT, M. A. **A Parasitological Survey of the Inhabitants of the Barnasht Area, Giza Province, Egypt, U.A.R. in 1959.** *J. Egyptian Med. Ass.* 1961, v. 44, No. 1, 68–84, 4 figs. [13 refs.]

The stools and urines of 1,000 persons of all ages, in the Barnasht area, were examined in this survey. Infection with *Schistosoma haematobium* was found in 45%; incidence diminished with age, sharply in women and slightly in men. Ankylostomiasis was found in 42%, but ascariasis in only 0·7%. Other parasitic infections found included *Trichostrongylus*, 7%; *Enterobius*, 4%; *Hymenolepis nana*, 2%; *Entamoeba histolytica*, 31%.

A Collective Unit had been carrying out an extensive programme of health, agricultural, social and educational improvements in the area since a similar survey was made four years previously. Nevertheless, that survey showed only 17% *S. haematobium* and 27% ankylostomiasis infections. The higher figure for schistosomiasis found in the later survey can be explained by the use of a more thorough diagnostic method. The near absence of ascariasis is attributed partly to the dry climate and sandy soil of Upper Egypt, but a marked decline since before the war is attributed to improved sanitation. Variations of incidence with age are discussed for each parasite. *B. B. Waddy*

BURKE, Barbara A., KROVETZ, L. J. & GOOD, R. A. **Occurrence of *Pneumocystis carinii* Pneumonia in Children with Agammaglobulinemia.** *Pediatrics*. Springfield, Ill. 1961, Aug., v. 28, No. 2, 196–205, 6 figs. [35 refs.]

"Two case histories of patients having apparent congenital agammaglobulinemia who succumbed to Pneumocystis carinii pneumonia are presented.

The high incidence of agammaglobulinemia or extreme hypogammaglobulinemia among patients with Pneumocystis pneumonia in Great Britain, Canada and the United States is stressed. The absence of gross deficiency of plasma cells in the pulmonary lesions and in the hematopoietic tissues of the children having agammaglobulinemia and Pneumocystis carinii infection is contrasted with the extensive plasmacytosis occurring in most children succumbing to infection due to this organism. The use of Giemsa staining of imprints from fresh or previously frozen pulmonary tissue as an ideal method for demonstrating the parasite is emphasized." [See this *Bulletin*, 1960, v. 57, 187 *bis*.]

BRAY, R. S. & GARNHAM, P. C. C. **Failure to infect Splenectomized Primates with *Theileria parva*.** [Research Notes.] *J. Parasitology*. 1961, Aug., v. 47, No. 4, Sect. 1, 538.

The authors have already infected splenectomized primates with bovine piroplasms [this *Bulletin*, 1960, v. 57, 954] and now report similar trials with *Theileria parva*. The studies were made with infected ticks *Rhipicephalus appendiculatus*. 20 each were applied to 2 chimpanzees which had been splenectomized respectively 2 years and just before the time of application. After 8 days, 14 had fed on one animal and one had become engorged on the other. The fed ticks were ground and inoculated intraperitoneally into both chimpanzees, which remained free from *T. parva* in the blood during the following 3 months. 20 more ticks were then applied to a sooty mangabey (*Cercocebus torquatus atys*) which had just been splenectomized, and 10 engorged during 14 days: the monkey died in 30 days without evidence of piroplasms in the blood.

These studies were made in the Liberian Institute of the American Foundation for Tropical Medicine. At the same time, in the London School of Hygiene and Tropical Medicine, 15 and 12 infected *R. appendiculatus* were applied to 2 *Macaca mulatta* splenectomized some 2 years previously. One tick engorged on the first monkey and 7 on the second: ticks from the second monkey were inoculated into the same animal. No *T. parva* was found in a lymph gland obtained from this monkey after 4 weeks or in the blood of either animal.

H. J. O'D. Burke-Gaffney

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene.]

STOHLER, H. R. **The Peritrophic Membrane of Blood Sucking Diptera in relation to their Role as Vectors of Blood Parasites.** *Acta Tropica*. Basle. 1961, v. 18, No. 3, 263–6. [11 refs.]

OGDEN, C. J. **Routine Blood Feeding for Insects.** *J. Roy. Army Med. Corps*. 1961, July, v. 107, No. 3, 176.

A text description is given of an apparatus found useful for feeding mosquitoes (*Aedes albopictus, Culex molestus*, and *Anopheles stephensi*) through

a membrane (hog-gut sausage skin, or ox-caecum) on human blood in an acid-citrate-dextrose coagulant, obtained from outdated stock of a blood-bank. Basically, it consists of 4 perspex cylinders ($1\frac{1}{4}''$ diameter) in a perspex water-bath, each cylinder protruding about half-an-inch below the base of the tank. These lower openings are fitted with suitable sizes of membrane and the blood added above where it was kept warm (34°C.) by the water in the bath heated by a 100-watt aquarium heater. Ox-caecum was the preferred membrane, but hog-gut is easier to handle. This apparatus then rests with its 4 membranes on the upper gauze surface of a cage of mosquitoes (probably about 1 ft. cube size). From 60% to just over 90% of mosquitoes fed within an hour. No ill-effects on fertility were apparent in the 3 species after 4 months' feeding on this citrated blood.

[The reviewer saw this apparatus at a demonstration, when large numbers of *A. stephensi* fed successfully, so that the percentage successes reported here are presumably based on quite large numbers.] *D. S. Bertram*

LAIRD, M. **Members of the *Culex pipiens* Series in New Caledonia and the New Hebrides.** [Correspondence.] *Nature*. 1961, June 24, v. 190, 1221–2.

The author has re-examined his collection of *Culex pipiens fatigans* from the South Pacific in the light of more recent systematics. It appears that the identifications are still valid, except that *C. p. australicus* should be assigned to larval material from the New Hebrides, and *C. p. iyengari* to part of the collection from New Caledonia and islands within 30 miles. *D. S. Bertram*

RIOUX, J. A. & PECH, J. Apparition de l'autogénèse dans un élevage de *Culex pipiens berbericus* Roubaud. [**Autogenesis in a Colony of** *Culex pipiens berbericus*] *C.R. Soc. Biol.* 1961, v. 155, No. 2, 343–4, 1 fig.

HADDOW, A. J. **Studies on the Biting Habits and Medical Importance of East African Mosquitos in the Genus *Aëdes*. II. Subgenera *Mucidus*, *Diceromyia*, *Finlaya* and *Stegomyia*.** *Bull. Entom. Res.* 1961, June, v. 52, Pt. 2, 317–51, 11 figs. [Numerous refs.]

This is a continuation of a previous paper [this *Bulletin*, 1960, v. 57, 653] in which the subgenera *Aedimorphus*, *Banksinella* (now *Neomelaniconion*) and *Dunnius* were discussed. The author now summarizes the cyclical biting activities of East African *Mucidus*, *Diceromyia*, *Finlaya* and *Stegomyia* mosquitoes from the results of some 448 24-hour baited catches, made principally in forest in Uganda. At the same time he discusses some of the complications in interpreting this mass of data; for example, many species of *Aedes* bite in the forest canopy or understorey, and while they may show a preference for a particular level, some make daily vertical migrations so that biting may reach its maximum intensity at different times of the day at different levels. Further, the biting behaviour of a species may vary from one area to another so that the combination of results from different localities may not be justified.

In the subgenus *Mucidus* the collections were mainly from Uganda forest

and they were made up almost entirely of *A. nigerrimus* and *A. grahami*. These two species appear to be strictly nocturnal and markedly arboreal in their habits in all the areas sampled. *A scatophagoides* and *A. mucidus*, together with an undescribed species, are less markedly arboreal, and certainly *A. scatophagoides* frequents bush and scrub more freely than do *A. nigerrimus* and *A. grahami*, and is relatively common at ground-level. The subgenus as a whole bites by night and less than 4% of the total specimens from all localities were taken by day. Both *A. nigerrimus* and *A. grahami* are most active in the middle part of the night.

The subgenus *Diceromyia* was poorly represented in the catches. In a mangrove swamp on the Kenya coast *A. adersi* was nocturnal but no peak of activity was apparent. This species is also markedly arboreal in its biting habits. The *A. furcifer-taylori* group is widespread but patchy in its distribution and was poorly represented in the catches. In Bwamba forest, Uganda, the group was crepuscular and arboreal but in open country specimens may be taken freely at ground level. In Bwamba there was a marked peak in the biting cycle in the hour after sunset.

The subgenus *Finlaya* was represented in the catches by only two species. The first, *A. ingrami*, occurs principally in secondary forest and in the forest fringe, and is a crepuscular, understorey species. This species makes daily vertical migrations and these are reflected in the catches at different heights during the day. In light forest near Entebbe, for example, there is a small peak of activity in the canopy in the hour after sunrise, an hour later there is a similar peak in the understorey, and an hour later still a peak at ground-level. In the evening the situation is reversed and the ground-level peak is first, followed by a sharp peak in the understorey just before sunset and by a more extended peak in the canopy, spread over the hour before and the hour after sunset. The second species, *A. longipalpis*, is a diurnal mosquito of the forest canopy with an activity peak in Bwamba in mid-afternoon. In contrast to *A. ingrami*, it prefers heavy forest, and there is no evidence of vertical migrations such as occur with *A. ingrami*. A former suggestion by the author that there may be separate physiological groups in the population of *A. longipalpis* biting at different times during the day is now revoked and shown to be unsound [*ibid.*, 1954, v. 51, 1110].

In the subgenus *Stegomyia*, *A. simpsoni* has been discussed at length. This species is markedly diurnal in its biting habits and at or near ground-level outside the forest the cycle may be biphasic; usually the highest activity is recorded in the afternoon. In forest on the other hand there is a steady rise from morning until the peak is reached in late afternoon. *A. simpsoni* bites readily in the forest canopy but shows a preference for banana plantations. *A. africanus* is also considered in some detail. This is a crepuscular and predominantly canopy species with a well-defined peak just after sunset in the canopy and understorey, but with an ill-defined cycle at ground-level, where there is general activity throughout the day. This species also appears to make daily vertical migrations. *A. aegypti*, *A. apicoargenteus*, *A. fraseri*, *A. dendrophilus*, *A. luteocephalus* and *A. ruwenzori* are briefly discussed and their biting cycles summarized.

With regard to their medical importance, some members of the subgenera discussed are of major significance as transmitters of virus infections. No viruses have been recovered from *Mucidus* or *Diceromyia* species (though some

of the latter have been suspected as vectors of yellow fever in some areas [*ibid.*, 1943, v. 40, 602]). The vector status of *Finlaya* is uncertain: possibly *A. longipalpis* may play a part in the transmission of yellow fever [*ibid.*, 1952, v. 49, 260], and the same species or *A. ingrami* may transmit Uganda S virus [*Bull. Hyg.*, 1953, v. 28, 484]. The subgenus *Stegomyia* includes several species implicated in the transmission of virus diseases, principally *A. aegypti* (yellow fever, Chikungunya, dengue and perhaps several other viruses), *A. simpsoni* (yellow fever), *A. dendrophilus* (Rift Valley fever) and *A. africanus* (yellow fever, Zika, Rift Valley fever, Chikungunya and possibly Ntaya virus).

W. W. Macdonald

McClelland, G. A. H. **Experimental Hybridization of** *Aedes* (*Stegomyia*) *aegypti* **(L.) with** *A.* (*S.*) *simpsoni* **(Theobald).** [Correspondence.] *Nature*. 1961, Apr. 22, v. 190, 369–70, 1 fig. [12 figs.]

It is first commented that recent work on cross matings of *Aedes aegypti* and *A. albopictus*, based on 50,000 eggs, produced only a single adult of intermediate character, a result indicating some chromosomal compatibility between these species, and a more conventional result than the controversial maternal dominance in crosses by earlier workers. Crosses of *A. aegypti* and the plant-axil breeder, *A. simpsoni*—by means of artificial persuasion to effect single pair matings—are here reported, and with good photomicrographs of the colour patterns of the dorsal surface of the head and thorax of 6 specimens. Hybrids of intermediate pattern were obtained.

D. S. Bertram

Kremer, M. Un ceratopogonide nouveau pour la faune française: *Culicoides begueti* Clastrier appartenant au groupe "*fascipennis*" sensu lato, et essai de classification de ce groupe. [**A Ceratopogonid New in French Collections,** *Culicoides begueti*, **belonging to the "***fascipennis***" Group. Attempts to Classify this Group**] *Ann. Parasit. Humaine et Comparée*. 1961, Jan.–Apr., v. 31, Nos. 1/2, 143–53, 2 figs. [17 refs.]

Spickett, S. G. **Studies on** *Demodex folliculorum* **Simon (1842). I. Life History.** *Parasitology*. 1961, May, v. 51, Nos. 1/2, 181–92, 3 text figs. & 10 figs. on 2 pls.

From histological study of infected human skin, and *in vitro* culture of *Demodex folliculorum* (in sebaceous material, with some penicillin and streptomycin, on the underside of a coverslip converted over a cavity slide and kept in a blackened Petri dish at 37°C.) it was possible to reconstruct the life cycle of the mite as follows, in hours: ovum (60), larva (36), protonymph (72), deutonymph (60) and adult female (120). The life cycle lasts about 14½ days. The male and deutonymph tolerated variable conditions best, and probably the latter is responsible for dispersal of infection in the pilo-sebaceous system on a single host, and between hosts. Only hair follicles and sebaceous glands were infected, and the contention, as for *D. canis* in dogs, that there is infection of lymph nodes with transportation *via* the vascular system is not thought

applicable to *D. folliculorum* in man; nor is intra-uterine infection thought possible in man. *D. S. Bertram*

COLE, M. M. & CLARK, P. H. **Development of Resistance to Synergized Pyrethrins in Body Lice, and Cross Resistance to DDT.** *J. Econom. Entom.* 1961, Aug., v. 54, No. 4, 649–51, 2 figs. [19 refs.]

DE MATTEIS, F., PRIOR, B. E. & RIMINGTON, C. **Nervous and Biochemical Disturbances following Hexachlorobenzene Intoxication.** *Nature.* 1961, July 22, v. 191, 363–6, 2 figs. [13 refs.]

An abstract of this paper appears in the *Bulletin of Hygiene,* 1961, v. 36, 1113.

HOCKING, B. **Further Considerations regarding the Repellency of Spray Components.** *Bull. Entom. Res.* 1961, Apr., v. 52, Pt. 1, 1–5. [13 refs.]

Carrier oils and solvents are required in such large quantities for the formulation of insecticidal sprays that they must be readily available and cheap. Unfortunately several such components have been shown to have an undesirable repellent effect [this *Bulletin,* 1959, v. 56, 578]. The same T-tube apparatus was used to measure the olfactory responses of *Drosophila melanogaster* and, in a few tests, *Musca domestica* and *Aedes aegypti* to air saturated with the vapour of several substances.

Light, middle and heavy distillates of Velsicol AR-50, Velsicol AR-55 and fuel oil, acetone, cyclohexanone, ethylene chloride, tetrahydronaphthalene, benzyl benzoate and dimethyl phthalate all showed a degree of repellency to the insects used, in approximately inverse relation to their volatility. This repellency is thus largely non-specific and, for each substance or class of substances, probably a function of the vapour concentration.

Butoxy-polypropylene glycol, widely used as a "repellent" ingredient in livestock sprays, was actually attractive to *M. domestica* and *A. aegypti.* The odoriferous air from a *Drosophila* culture was attractive to *D. melanogaster.*.

While little hope is given for a non-repellent, economic base component, it is suggested that repellency might be counteracted by addition of a specific attractant. The more repellent solvents might be useful alone as non-toxic space repellent sprays. *G. A. H. McClelland*

TARSHIS, I. B. **Laboratory and Field Studies with Sorptive Dusts for the Control of Arthropods affecting Man and Animal.** *Exper. Parasit.* New York. 1961, Feb., v. 11, No. 1, 10–33. [19 refs.]

A synthetic silica aerogel, SG67, in combination with ammonium fluosilicate having several well-known industrial uses, adheres well to bodies of arthropods and other animals, besides surfaces of buildings and the like. The aerogel absorbs lipids from insect cuticle, with resultant death of the creature by water

loss. Laboratory trials successful against different species of cockroaches, fleas, mites, ticks, lice, reduviid bugs and crickets, are reported in some detail including, for comparison, results with 109 other compounds, mostly less promising. Field trials of SG67 include control in homes, restaurants, hospitals, shops, flats, ships etc., of cockroaches within a few days after dusting in and around foci of aggregations, on occasions dusting more freely in attics etc.; control was maintained for many months. Other arthropods reported successfully controlled under conditions of natural infestations by dusting foci of ectoparasites, or the infected hosts themselves (without harm), include fleas of rats, dogs and cats ; lice, including cattle lice ; bedbugs ; crickets ; mites on caged snakes and birds in a zoo; dog ticks; dermestid beetles; also tyroglyphid-type mites. None of the following laboratory animals—cats, dogs, rats, mice, rabbits and monkeys—treated for ectoparasites suffered apparent ill effects, " nor did the compound interfere with any of the experimental work being carried out on these animals ". [This could well be a different story in work in which such animals are the hosts of bloodsucking arthropods, either in vector experiments or simply for maintaining arthropod strains. Such a persistent and apparently very effective substance, particularly in dust form, would require to be used with discretion if live strains of arthropods are, besides other laboratory stock, being maintained.]

Within 10 minutes of dusting various birds (with seemingly 0 to 50 ectoparasites evident by inspection) the yield of mites and lice, on ruffling the feathers, was several hundreds. [This could be a useful sampling method.]

D. S. Bertram

Bull. World Health Organization. Geneva. 1961, v. 24, Nos. 4/5, 611–49, 18 figs. [Numerous refs.] **Disinsection of Aircraft with DDVP.**

The five papers and three notes summarized in this abstract are about the organophosphorus compound DDVP (0, 0-dimethyl-2, 2-dichlorovinyl phosphate), primarily with regard to its use for disinsecting aircraft but with indications, particularly in the last of the series, for its slow dispersion for the control of mosquitoes and other insects frequenting buildings.

Two papers report on the safety of DDVP with special reference to the use of its vapour for disinsecting aircraft. DDVP is a direct inhibitor of cholinesterase. It is exceptional among organophosphorus compounds in its vaporization at moderate temperatures, the resultant vapour exerting its insecticidal effect and being the chief source of toxicological risks to man under the conditions proposed for its use in aircraft, and in public health practice generally. In *Safety of DDVP for the Disinsection of Aircraft* by W. J. Hayes (pp. 629–633) experiments with rats, and man, lead to the conclusions that acute toxicity is moderate, although considerably greater than that of malathion, and that the safety factor is high if it is used at a vapour concentration of 0·15–0·25 μgm. per litre of air for 30 minutes. Oral and dermal applications (with rats) indicated relative toxicities as follows: *oral* LD50 mgm./kgm. of 80 (DDVP), 15 (parathion) and 1375 (malathion) and a *dermal* LD50 mgm./kgm. of 107 (DDVP), 21 (parathion) and 4400 (malathion), so that concentrated DDVP formulations are dangerous. This paper and that on *Studies on the Safety of DDVP for the Disinsection of Commercial Aircraft* by R. F. Witter, T. B.

GAINES, J. G. SHORT, V. A. SEDLAK and D. R. MADDOCK (pp. 635–642)—the latter experimenting with man and monkeys—are in agreement on the wide safety margin to vapour at 0·15–0·25 μgm. DDVP per litre of air for 30 minutes, the threshold for slight effect on blood cholinesterase levels in man being about 0·9 μgm. to 3·5 μgm. per litre of air when exposed for 1 and 2 hours daily for 4 consecutive days. Other work has indicated 1 μgm. DDVP per litre of air over 8 hours as a permissible exposure in industry. Detoxification is rapid in mammals; deaths in experimental animals are rare. There is need, however, for continuing investigation on the effects of more prolonged exposure, and recurring exposure, on human beings with attention to possible effects on the efficiency of aircrew in their flight duties.

As described by G. W. PEARCE, H. F. SCHOOF and K. D. QUARTERMAN in *Insecticidal Vapours for Aircraft Disinsection* (pp. 611–616), DDVP was discovered as a contaminant in tests of Bayer L13/59 against flies and proved to be odourless, non-irritant, harmless to aircraft fabrics and of better efficiency as an insecticide than other substances, including DDT and pyrethrin formulations currently in wide use for disinsecting aircraft. Insecticidal action is discussed by D. R. MADDOCK, V. A. SEDLAK and H. F. SCHOOF in *Dosage-Mortality Response of Musca domestica exposed to DDVP Vapour* (pp. 643–644), by D. R. MADDOCK and V. A. SEDLAK in *Dosage-Mortality Response of Anopheles quadrimaculatus exposed to DDVP Vapour* (pp. 644–646) and, as tested with flies in commercial aircraft on ground and in flight, by H. F. SCHOOF, J. A. JENSEN, J. E. PORTER and D. R. MADDOCK in *Disinsection of Aircraft with a Mechanical Dispenser of DDVP Vapour* (pp. 623–628). Normally susceptible strains and strains resistant to other insecticides were tested. From such studies, the recommended exposure of 0·15–0·25 μgm. DDVP per litre of air for 30 minutes was derived as effective for *Musca domestica;* mosquitoes (*A. quadrimaculatus* and *Aedes aegypti*) were even more readily killed. Kills were better in flight conditions, and with free rather than caged insects.

The equipment required in aircraft is described by J. A. JENSEN, G. W. PEARCE and K. D. QUARTERMAN in *A Mechanical System for Dispensing Known Amounts of Insecticidal Vapours* (pp. 617–622) and this paper suggests that the system could be adapted for numerous insect pest problems in houses, restaurants, ships, stores for fabrics and commodities, animal and poultry sheds, etc. The installation for an aircraft, as tested in a DC-6 and DC-7, consists of a compressor passing cabin-air through a DDVP-impregnated cartridge and dispersing the vapour through small apertures in a tube running along the ceiling of the cabin space. The necessary concentration is maintained well during the specified half hour, as a graph shows, and falls off rapidly when active dispersion is stopped. This is partly mechanical settlement, but hydrolysis in moist air also occurs. There is no significant residual build-up on surfaces. The system weighs only 15 lb. (7 kgm.) and is actuated by a press-button with automatic timing (preferably done in flight). A specification of all parts including small electric motor, etc., is given, with cost working out below £100. Minor variations in specification arise for each kind of aircraft and data are given for several (DC-3 to DC-8 series, Boeings, Electra and Constellation airliners). All these papers accept the use of DDVP vapour for disinsecting aircraft as a new and most promising technique, and provide much data to support its further development in practice. General usage awaits the

findings of long-term tests of toxicity to man and these should be concluded during 1961.

The final paper of the series, *Relationship of Ventilation and Dosage to the Effectiveness of DDVP as a Residual Fumigant* by W. Mathis, J. W. Miles and H. F. Schoof (pp. 646–649), reports on the effectiveness of DDVP vapour, vaporizing from compacted cylinders (5″ × 1½″) of technical DDVP and inert binding—on *A. quadrimaculatus* in experimental huts of 1,000 cubic feet capacity. DDVP cylinders were suspended in varying numbers in the huts between 8 p.m. and 8 a.m. for many weeks, huts varying from closed to ventilated by open doors, windows and eaves. Concentrations of 0·002 μgm. to 0·045 μgm. DDVP per litre of air were quite consistently maintained and effective kills (70% mortalities) obtained up to 11 to 12 weeks. A minimal effective dose appeared to be about 0·008 μgm. per litre of air. Mud walls did not interfere with insecticidal action, but loss of vapour through thatch roofing caused inefficiency, with poor kills after 3–4 weeks. This "residual fumigant technique" is to be tried in West African village huts. *D. S. Bertram*

Figura, V. Attuali conoscenze sull'impiego dei radioisotopi e delle radiazioni ioizzanti in entomologia. [**Current Knowledge of the Use of Radio-Isotopes and Ionizing Radiations in Entomology**] *Nuovi Ann. d'Igiene e Microbiol.* 1961, Mar.–Apr., v. 12, No. 2, 156–70, 1 fig. [86 refs.] English summary (9 lines).

A review and discussion.

Herms, W. B. **Medical Entomology.**

This book was reviewed on p. 1309.

MISCELLANEOUS PAPERS

Depauw, W. Étude comparative des critères de robusticité et d'aptitude physique des jeunes noirs (18 à 24 ans) à Léopoldville. [**Comparative Study of Criteria of Robustness and Physical Fitness in Africans aged 18–24 Years in Léopoldville**] *Ann. Soc. Belge de Méd. Trop.* 1961, Oct. 31, v. 40, No. 5, 733–58. [Numerous refs.]

A comparison is reported between nutritional state, *robusticité* and fitness of 50 fit young Africans in training and 50 untrained students of medicine between 18 and 24 years of age in Léopoldville in the Belgian Congo.

Both groups were smaller and lighter than Europeans of comparable age. Stem height was smaller absolutely, and so also, in all probability, was its proportion of the standing height. The greater length of limbs in Africans was confirmed by the span, which was always greater than the height. Body surface area was thought to be proportionately less than in Europeans.

Mean blood pressure, red blood cell count and % haemoglobin were somewhat lower than had been previously reported but there was no evidence of anaemia.

Chest circumference was greater in students, but this was attributable to their greater weight. Trained Africans had a higher vital capacity. Maximum breathing capacity in 21 subjects of both groups averaged 94·5% of that predicted on body surface area and age.

Robustness was assessed (1) by formulae based on body dimensions (Pignet, Röhrer), (2) by indices of cardio-vascular respiratory fitness (Spehl, Hansoul, De Laet), and (3) by actual performance tests (Harvard step-test). Trained students were superior to the untrained in all 3 methods of assessment. Performance tests were greatly superior to the others in discriminating between fit and unfit. *M. L. Thomson*

WELLER, T. H. **Tropical Medicine Today.** *New England J. of Med.* 1961, May 4, v. 264, No. 18, 911–14.

By tropical medicine the author means the whole field of diseases common in the hot (and often underdeveloped) countries. Disease patterns change, and even the changes—for instance the control of malaria—bring new problems. Ecology—the relationship between man and his environment—is obviously important, and this too is constantly changed as medical and social conditions change; the practice of tropical medicine is "a multidisciplinary activity" as when, for instance, the agriculturalist insists that rice fields must be kept under water to control the rice-stem borers, while the malariologist insists on intermittent flooding. The relative importance of curative and preventive services is a continuing problem, as pointed out by BULL [this *Bulletin*, 1961, v. 58, 761].

All these factors mean that it is folly to expect that medicine as taught in the schools of highly advanced Western countries is necessarily suitable for the more primitive conditions, yet this kind of Western medicine is being introduced to the tropics. "In one such school in the tropics the graduates discuss cardiac catheterization and steroid metabolism in the best tradition of New Haven and Boston and yet are unable to identify malaria parasites . . ." This is "the fallacy of imitation".

[The inferences of this thoughtful address are sufficiently obvious.]

Charles Wilcocks

KLOKKE, A. H. **Medical Care in the Tropics.** *Lancet.* 1961, June 17, 1336–8.

The author makes several points. The first is that the rise of nationalism seems to be associated with the revival of traditional medicine, as in China; and this is not merely a matter of national pride, but is also related to economics (in that traditional medicines are as useful as placebos as those prescribed so universally in the West and are much cheaper and more well known), and to the fact that the traditional practitioner's aim is to establish intimate and personal contact with his patient, which satisfies the mind and which is not the obvious system followed by the Western doctor, syringe in hand and held remote from the patient by his subordinate helpers.

Preventive medicine, especially in times of financial stress, tends to be subordinated to curative medicine, and vast treatment campaigns do not encourage the people to change their way of life, though this is an essential for the improvement of health, or to accept responsibility for their conditions.

These are social factors, and they are by no means confined to the so-called primitive peoples; they are found in the West, and the author suggests that sociology should be studied as an aid in correcting attitudes to health, but also that, as a preliminary to training for medical work in the tropics, the training in sociology should begin at home. *Charles Wilcocks*

GELFAND, M. [Edited by]. **Doctor on Lake Nyasa—Being the Journal and Letters of Dr. Wordsworth Poole (1895–1897).** *Central African J. of Med.* 1961, May, v. 7, No. 5, Suppl., 70 pp., illustrated.

Gelfand has a great sense of history. In his preface he tells how the letters of Wordsworth Poole came to his notice, and how, on reading them, he realized that they were important, not only from the point of view of the early medical history of Nyasaland, but also from the general historical point of view. He has therefore published them, interspersed within his own account of the history of the country, and the story of Sir Harry Johnston's administration, which included the suppression of the slave trade in those parts. The account is illustrated by contemporary photographs and maps.

Poole's journal opens when he left Cairo in February 1895, to reach Quelimane in March and Zomba in April. It is not mainly devoted to a description of medical conditions but it does contain many references to his work, a depressing record of malaria, blackwater fever, dysentery, injuries and tetanus. He lost his mosquito net in 1895, but that was before Ross's discovery and therefore he apparently thought nothing of it. Most of the record is of journeys and military expeditions, and of his day-to-day experiences as an excited and enthusiastic observer of tropical life.

Poole left Zomba for England in June 1897; he then went with Lugard to West Africa, serving with the West African Field Force. At home after that he had an attack of blackwater fever, and then served in Peking as Legation doctor, being involved in the siege of 1900. In 1901 he had jaundice, and in January 1902 he died in Peking of typhoid fever. He was 33 years old.

The journal and letters vividly remind the reader of the immense changes which have taken place in the effectiveness of treatment in the last few decades. They are interesting and important records, which deserve the well-informed commentary and history supplied by Gelfand, on which he is to be congratulated. *Charles Wilcocks*

REPORTS AND SURVEYS

JELLIFFE, D. B., BENNETT, F. J., STROUD, C. E., NOVOTNY, M. E., KARRACH, H. A., MUSOKE, L. K. & JELLIFFE, E. F. P. **Field Survey of the Health of Bachiga Children in the Kayonza District of Kigezi, Uganda.** *Amer. J. Trop. Med. & Hyg.* 1961, May, v. 10, No. 3, 435–45, 8 figs. [13 refs.]

The Bachigas are a Bantu tribe inhabiting the mountainous district of Kigezi in the extreme west of Uganda, bordering the Congo and Ruanda-Urundi on the Equator. Population is increasing, and pressure on the land, particularly around the main town of Kabale, is the cause of poverty and malnutrition. One of the overflow areas for the resettlement of the more crowded parts of the district is Kayonza, a hilly rural district, altitude 3,000–7,000 ft., lying on the edge of the Impenetrable Forest. Here the forest is gradually being opened up by the clearings of peasant-farmers living in widely scattered houses; immigration has helped to double the population in the last 5 years. This survey of 258 infants and 585 children aged 1 to 3 years—the whole population of children aged up to 3 years in Kayonza—was undertaken in December 1959 to assess the prevalances of malnutrition, of common diseases of early childhood, and of conditions in any age-group liable to become public health problems prejudicial to resettlement.

The clinical methods of the survey and assessment of the findings were similar to those described by JELLIFFE and JELLIFFE [this *Bulletin*, 1961, v. 58, 244] but without the measurement of skinfolds, and including thick blood films, stool samples, and haemoglobin estimations. Only 2 children had kwashiorkor, 11 had marasmus, there was negligible oedema, or angular stomatitis, and no specific avitaminosis. 80% of the children had less than 11 gm./ml. haemoglobin. Assessment by the Gomez weight classification showed that nutritional status was not markedly subnormal. Childhood mortality was low by tropical standards with a sibling mortality [the percentage of non-surviving siblings of children who attended] of 18%.

Cow's or goat's milk, and other animal foods, play an insignificant part in the family dietary. The good nutritional state of this group compared with tropical children in many other places, including those is other parts of Kigezi, is attributable to a variety of factors: the lack of population pressure; the low incidence of malaria and hookworm disease; the small distances between homes, farms, and sources of water which save mothers from much physical strain; and local methods of infant feeding. Breast-feeding was universal throughout infancy, continuing into the second year for 83·4%, and for a number of children into the third year. Foster mothers would feed children whose mothers died. Some parents gave additional semi-solid foods in the first 6 months, and all of them did so in the second. The two principal foods were a millet-gruel, prepared from sorghum or finger-millet that had been germinated by soaking for 24 hours with ash, and steamed plantain. In the second year in addition to the breast milk, there was a mixed diet of plantain, millet-gruel, beans, sweet potato and millet-meal. Bottle-feeding was not practised. This is an excellent combination of sufficiently prolonged breast feeding, with a good mixed transitional diet containing millet and beans, two most valuable local sources of protein. *T. P. Eddy*

JELLIFFE, D. B., JELLIFFE, E. F. P., GARCÍA, L. & DE BARRIOS, G. **The Children of the San Blas Indians of Panama. An Ecologic Field Study of Health and Nutrition.** *J. Pediatrics.* St. Louis. 1961, Aug., v. 59, No. 2, 271–85, 7 figs. [27 refs.]

The district of San Blas on the Caribbean coast of Panama is inhabited by Cunas, Amerindians of unmixed stock. It contains over 360 small coral islands, covered with coconut palms, and extends 150 miles along the coast of jungle-covered mainland. The Cunas live in villages on the islands where they rear pigs, chicken and turtles, and catch a variety of fish and shellfish. On the mainland, family plantations supply plantains, yams, cassava, maize, sugar cane, rice, cocoa, coffee, tobacco and some fruit. The Cunas therefore live on a mixed diet, and are fairly prosperous.

Using methods previously described [above] the authors examined 129 infants and 377 children 1–4 years old, and made a more superficial house-to-house inspection of 80 infants and 183 pre-school-age children.

There was no kwashiorkor or other sign of severe protein-calorie malnutrition. Clinical rickets was seen in 5 of the 129 infants and 9 of the 377 older children. The Gomez weight classification, with INCAP weight standards for South America, showed "normal" weights in the first 6 months, with retarded growth from 7–30 months, and some improvement from 31–48 months. Anaemia was shown by haemoglobin estimations of less than 11 gm. % in about half the children. Common diseases were dental caries, skin infections, ascariasis, albinism, and respiratory infections, probably including tuberculosis.

Breast feeding is commonly practised up to 24 months and often for much longer periods, but rather less by more sophisticated mothers after 18 months. In the second 6 months such paps as mashed banana, yam and maize flour are introduced, with very small amounts of evaporated milk in some islands. The retardation in weight after the first 6 months is attributable to the failure to introduce a more mixed diet based on available local foods, especially fish—a common finding in tropical communities. The custom of confining women to sunless houses throughout pregnancy, and the belief that sunshine is harmful to young children, cause rickets. Anaemia is probably caused by the carbohydrate diet, and the lack of iron in breast milk.

Improvement depends upon education and the likely movement from traditional beliefs and practices to more modern ways. If existing practices of breast feeding are maintained while health education is introduced, there is hope that the ill effects of urbanization and sophistication on child health, so common elsewhere, may be avoided. *T. P. Eddy*

FRY, E. I. **Health Survey of Children from Rarotonga, Cook Islands. IV. Physique as determined by the Wetzel Grid.** *J. Trop. Pediatrics.* London. 1961, Sept., v. 7, No. 2, 49–54, 3 figs. [14 refs.]

"An analysis of data on the height and weight of 232 Polynesian children using the Wetzel Grid technique has been presented. This analysis shows the Rarotongan children to be growing at an erratic rate, but with generally normal, by United States standards, height and weight relationships until late

puberty. After the age of 15 years for the girls and 18 years for the boys, weight gains are continued, while stature gains have slowed down. These weight increases without stature increases move the Rarotongans into the channels which WETZEL calls ' obese '.

" The Rarotongan children tend to fluctuate greatly in their yearly height and weight gains, and their average yearly gains are not as large as those of the average American child. The usefulness and applicability of the Grid to this group of Polynesian children is questioned."

[See also this *Bulletin*, 1961, v. 58, 648.]

BOOK REVIEWS

GELFAND, Michael [C.B.E., M.D., F.R.C.P., D.P.H., D.M.R.]. **Medicine in Tropical Africa. A Realistic Approach.** Foreword by Neil Hamilton FAIRLEY, K.B.E., M.D., F.R.C.P., F.R.S. 243 pp., 114 figs. 1961. London. Edinburgh: E. & S. Livingstone Ltd., 16–17, Teviot Place. [30s.]

Dr. Gelfand has made many contributions to medical literature, notably accurate factual observations of the diseases met in Southern Rhodesia. In this volume he adopts a different, more philosophical or essay-like approach, considering the problem of the African and his reaction to disease as a whole.

He reminds us that the pattern of disease depends on the interaction of the individual and his environment; the latter comprising social and nutritional as well as infective factors. In the second chapter he surveys the differences in the pattern as it occurs in the African, or more particularly the Southern Rhodesian African, from that occurring in races of European origin and culture. A minor point of criticism might be that he does not emphasize enough the considerable variability of disease pattern in Africa, where there are not one but many races living under widely different environmental conditions. With this variability generalizations are difficult, and unless carefully qualified, may be unsound.

In the third chapter he develops an interesting thesis; the division of the African into traditional or illiterate, semi-traditional or semi-literate, and literate [see this *Bulletin*, 1960, v. 57, 313]. He discusses the differences both in general development and in disease, and points out that, contrary to the views of Rousseau, being too close to nature has more disadvantages than advantages.

In the next chapters he discusses some general problems: the mental inheritance and development of the African; parasitic disease and the reactions, both individual and social, to it; the questions of immunity and treatment; and of course the universal background of malnutrition. Perhaps one of the most interesting sections is that on the reaction to parasitic infection; in those diseases where substantial immunity develops, how far should we interfere?

How great is the price paid in infant mortality and maldevelopment? Does treatment followed by reinfection leave the victim better or worse off?

Finally he devotes several chapters to specific problems of special tropical interest: the enormous problem of diseases of the liver and spleen, with their multiple aetiologies; the tropical anaemias, with their differences from the anaemias of developed countries; the subject of tropical heart disease with its different pattern, and the emergence of new types of cardiomyopathy and endomyocardial fibrosis; and the ever-present background of chronic renal disease.

This is a book which the reviewer enjoyed, mentally comparing experiences with the author, dissenting sometimes but agreeing generally. Its chapters would form an excellent basis for a series of tutorials or discussion-group sessions. It is not, however, a textbook, or an introduction for the beginner, but rather a mental stimulant to those who have read or seen something of tropical disease. *A. C. E. Cole*

MANSON-BAHR, Philip [M.D., F.R.C.P., D.T.M. & H.] & WALTERS, John H. [M.D., F.R.C.P.]. **The Chemotherapy of Tropical Diseases.** pp. xi + 164. 1961. Springfield: Charles C. Thomas, Bannerstone House, 301–327 East Lawrence Avenue, Ill., U.S.A.

This small volume is one of a series on "Living Chemistry" intended, according to the editor in his foreword, "to advance our newer knowledge of chemical medicine in the cause of clinical practice".

The authors have dealt with their subject-matter by dividing it into chapters determined by the cause of the conditions for which chemotherapy is available. Thus there are grouped together in one chapter the protozoal diseases, and in the next the spirochaetal, then rickettsial, bacterial and fungal respectively are followed by nutritional, by climatic, and by diseases due to metazoal infections. A final chapter is concerned with the venereal diseases, and there is an appendix listing the drugs used, with their alternative nomenclature, their doses and routes of administration, and the conditions for which they are advocated.

Prefatory to the accounts of the chemotherapeutic treatments and their side effects there is a general account of each of the disorders dealt with, a consideration of their parasitology where appropriate, and a very short account of the salient features of the clinical picture of each. There seem to be some inconsistencies in the compilation: blackwater fever is not dealt with—probably rightly, as its treatment can hardly be called chemotherapeutic—though conditions due to environment and climate are, albeit very shortly, even if "chemotherapy" enters as little into their treatment. The same, though with less justification, might be said of the nutritional and vitamin deficiency diseases. A surprising omission in such an account is leprosy; this particularly as the brucelloses receive considerable attention though today they are much less "tropical".

This very small book is not intended to be a textbook on its subject; it is an essay or lecture depicting the present scope of chemotherapy and its potentialities in the treatment of tropical diseases, and also of some of the ubiquitous diseases which flourish in the tropics. As such it can be consulted with interest and benefit by those for whom it has been compiled. *A. R. D. Adams*

CHANDLER, Asa C. [M.S., Ph.D.] & READ, Clark P. [M.A. Ph.D.]. **Introduction to Parasitology with special reference to the Parasites of Man.** 10th Edition. pp. xii + 822, 258 figs. 1961. New York. London: John Wiley & Sons Ltd., Gordon House, Greencoat Place, S.W.1. [78s.]

Professor Asa Chandler died in 1958 while in the course of preparing, with Clark P. Read, the tenth edition of his *Introduction to Parasitology*. The revision of the section on the arthropods is largely the work of the senior author, while the chapters on protozoa and helminths were amended by the junior. The book preserves its character as an interesting account of parasitology written for the student of the medical and veterinary sciences. The subject is treated on a world-wide basis, but the chief emphasis is placed on North American species (keys, etc.) which makes the book rather more suitable for readers in the United States than elsewhere, but the touches of humour and wisdom which colour nearly every page, make it a pleasure and benefit for anyone to read.

Parasitology is still growing rapidly and much new matter has been added to the text since the last edition, though it still remains of a handy size and does not look too formidable. The authors' practical experience in the field in temperate and tropical regions has given the book a biological and epidemiological framework which field parasitologists will find most useful. This has been done to the detriment of morphology and systematics, and the purely laboratory worker will need to pursue these aspects in more specialized monographs. A minimum of these important features is however provided, and in general, each parasite is described under the following headings: structure, life cycle and epidemiology, pathology and disease, immunity, diagnosis, treatment and control.

The section on protozoa illogically includes a new chapter on "Arthropod-Borne Organisms Other Than Protozoa" (*viz. Rickettsia, Anaplasma, Bartonella*, spirochaetes and bacteria, and viruses). Much of the information in this chapter is duplicated in the third part of the book, which deals with arthropods and their relation to disease. The composite nature of the subject always makes its scientific presentation difficult in a textbook for students; possibly a good solution would be the elimination of the "vectors of disease" aspects from the arthropod chapters, which should be confined to purely entomological (or other vector) questions; the former could then be inserted in the proper place under the specific pathogen. In order to discuss general relationships, two chapters might be added: (1) Arthropods and Other Invertebrates as Vectors of Disease, and (2) Zoonoses or Animals as Reservoirs of Infection.

The illustrations (chiefly in the form of line drawings) are clear and excellent; the bibliography has been carefully prepared so that the student can easily pursue his studies in the appropriate direction. The book is now well up to date, and exactly fulfils the expectations assumed by its title.

[For review of 9th Edition, see this *Bulletin*, 1956, v. 53, 690.]

P. C. C. Garnham

DE MEILLON, Botha, DAVIS, David H. S. & HARDY, Felicity. **Plague in Southern Africa. Vol. I. The Siphonaptera (excluding Ischnopsyllidae).** pp. viii + 280, numerous illustrations. 1961. Pretoria: Govt. Printer, Republic of South Africa. [R4; 40s.]

This splendid work draws its facts from available information on fleas and their hosts in relation to plague by various workers who have entered this field, particularly since 1926 and especially from the long, fruitful surveys developed by the two senior authors since 1938. Volume I, here published, is primarily about the fleas of southern Africa while Volumes II and III, to follow, will be devoted, respectively, to the small mammal hosts of the fleas and to the ecology of plague which still persists in rodents of semi-arid and arid regions of southern Africa.

Southern Africa is here defined as the area of the continent south of the line of the Zambesi River, the Caprivi Strip and the northern border of South West Africa. Some data for Barotseland north of this limit are included.

Of 10 families of flea recorded from the Ethiopian (Aethiopian) Region, 2 small families are not represented in South Africa, 7 are represented by 1 to 35 species, while that of bat fleas is to be reported on elsewhere (by MARCUS, *J. Entom. Soc. S. Africa*). Nearly 200 species of flea are known from the Ethiopian Region and of 88 which occur in southern Africa about one-half are not yet recorded from outside this area. In part, it is noted, this is due to more intensive flea-collecting in southern Africa. But the facts that 2 families and 2 subfamilies (out of 16 and 30, respectively, of fleas in the world list) are found only in this Region and that bird fleas are remarkably infrequent (despite thorough examination of at least 1,000 different birds and many nests), indicate an early faunistic isolation of the Ethiopian from other zoogeographical regions. It seems, too, that paucity of bird fleas in Australia indicates that both these regions were isolated before evolution of flea stocks towards avian associations took place.

Pulex irritans and *Tunga penetrans* are the sole species of their particular genus; Ceratophyllidae number only 16 Ethiopian species, of which only 2 (*Nosopsyllus fasciatus*, of wider distribution, and one other species known only from S. Rhodesia) occur in southern Africa. On the other hand, *Xenopsylla* species are numerous—55 Ethiopian species with 35 in southern Africa and, of these, 22 species known only in this region. These include *X. cheopis* and *X. brasiliensis* (quite widespread in Africa) but not *X. astia* which is known only, in the Ethiopian Region, from Kenya and Arabia. A table gives rapid reference for each species regarding its distribution in the Ethiopian Region and, within this, southern Africa. A section discusses succinctly aspects of zoogeography.

Isolations of *Pasteurella pestis* (from 1940-1957), usually by inoculation of flea pools into test animals, were made from 16 species of flea. Most isolations (75 of 87 positive pools) were from pure pools of "gerbil" fleas, *Xenopsylla philoxera* and *Dinopsyllus ellobius*, and from the rural "rat" flea *X. brasiliensis*, species known to be vectors among wild and domestic rodents and to man. These three species also feature as predominant elements in a further 106 positive pools of mixed flea species. A single positive pool (pure or mixed species) was obtained for *P. irritans*, *X. cheopis*, *N. fasciatus*, *Ctenocephalides felis strongylus* and three for *Leptopsylla segnis*. The infected *P. irritans* were thought to have transmitted plague within a family in a hut, in 1949; this is the only known instance in the area.

As regards hosts, it is pointed out that despite the fact that fleas will accept different hosts, it is seen from this intensive work that host specificity is greater than formerly conceded. Each species of flea "usually has one, but

not often two or more, principal hosts". Among closely related *Xenopsylla*, knowledge of the host can be crucial to identification. A list of flea wild hosts for southern Africa includes 7 species of insectivores; 2 bat species; vervet monkeys; anteater; pangolin; 24 species of carnivores; aardvark; hyraxes and dassies; bushpig, warthog; duiker, grysbok and bushbuck of the bovids; 5 hare or rabbit species; and 46 species of rodent. Only 13 species of bird have been found with fleas, either on themselves or in nests. A table also gives the range of flea species per host.

The main body of the text is descriptive of fleas, each species being accorded its synonymy, description of male and female, geographical distribution (for mainly southern Africa), host associations, status as plague vector, and ecology with special reference to varying conditions in southern African territories. Intentionally, detailed morphological description of a flea is omitted in favour of 62 plates of line drawings (often of several separate drawings) of flea structure related to specific descriptions; these seem very adequate without excessive text. There are numerous keys throughout. Neither descriptions nor keys, it is emphasized by the authors, need necessarily be applicable outside the area covered by this study.

Particular interest and convenience, indeed fascination, attach to the 36 maps of southern Africa, one of which is both geographical and ecological and is repeated as a folder from the back cover for easy reference; another shows the plague enzootic areas and human plague records of southern Africa (1919-1959); there is one of the distribution of collections (commendably dispersed); and each of the remaining 33 maps gives the distribution of one, or sometimes more, flea species. The maps were specially prepared on the degree-grid system at the Medical Ecology Centre, Johannesburg, and its usage for exact location of collection is described.

This well-designed manual, embodying so much careful thought and work in the field and in the laboratory, also provides a gazetteer to about 150 place names not on the regional map, a section on technique for preserving fleas, a list of about 50 references, and an index to the information on the fleas. The authors regret that the plague index of flea species could not be based on more elaborate techniques than pool-testing, and emphasize the advisability of using the keys carefully and in the light of all relevant information about a collection. Statistical data on variables such as bristle counts were not often found worthwhile, or helpful. *D. S. Bertram*

Printed in Great Britain by The Eastern Press, Ltd., London and Reading